the OIL AND GAS JOURNAL

FEBRUARY 24, 1958

Will U.S. Oil Producibility 'Peak' in '67 ?

Page 105

Industry Slows Pace To Prevent Price Break p. 81

Refiners Apply New Yardstick to Crudes p. 125

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the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Feb. 24, 1958

The oil market-supply situation is touch and go:

Outcome will depend on how much everyone in the industry is willing to sacrifice.

At present there's a feeling of crisis throughout the industry. Nearly every segment is moving fast to:

...Cut back production.

An amazing thing is taking place among ranks of the oil producers. Independents, who usually pressure for as much production as possible, now are clamoring for severe cutbacks. Some even are openly advocating a temporary shutdown.

Prorated states are making historic reductions in flow of oil. Buyers are helping in unprorated areas by cutting back purchases.

...Cut down refinery runs.

Crude runs usually start dropping this time of year. But many refiners are kicking them down harder and quicker, putting units down for turnarounds earlier.

This will help if enough companies follow the lead.

...Hold the line on imports.

What happens to foreign oil is becoming the key to the whole present crisis.

Rush of domestic refiners for quotas will force some basic decision soon in Washington. This should come next month.

If import controls fail, foreign oil will rush in to fill the market vacuum created by production and refinery cuts. It could mean chaotic conditions.

How long will it be before conditions get better?

Some say 3 months. Others say midsummer. One unusually pessimistic source predicts 10 years.

Present crisis is due to decline in industrial activity, slump in demand, and failure of oil industry to cut back deeply enough following Suez period.

Factors which could help: Present cold weather continue for couple more weeks. A good spring planting season. Warm early vacation season to put motorists on the road. The expected upturn in general business by midyear.

If the present looks glum. Maybe the future's better.

Nation's capacity for still greater economic growth is

underscored in new report of Committee for Economic Development.

By 1975, committee predicts average income of American families after payment of all taxes should be at least $7,100. Present average disposable income is $5,300 per family.

Price of this expansion: Improved public education, continuous investment in enterprise, increased private savings, mobility of both labor and capital, efficient management of business and government, and rising foreign trade.

Gen. Marcos Perez Jiminez, deposed military dictator of Venezuela, is now a buck private.

Venezuela's general staff formally retired its ex-boss along with three other generals last week.

Colorado's gross income tax on oil and gas production has been upheld by a Denver district judge.

The California Co., largest producer in Colorado, lost on every point of its suit challenging the 5 per cent levy.

A floating doughnut-type vessel is being tested by Shell for drilling in deep water (p. 96).

It's a circular vessel with a hole in the center for drilling.

Shell officials hope it may be the key to working in water depths where other drilling platforms can't operate.

CATC Group has a triple-zone producer at its wildcat drilled in deepest water ever attempted in the gulf.

Drilled to 13,495 ft., the well produced at a rate of 443 bbl. daily from two zones plus ungaged amount of oil from a third interval.

Location is in Block 70, West Delta area, 23 miles off Grande Isle, La.

Foreign notes: Naptha Israel Petroleum is drilling ahead at its Rash Zohar 1 near the Dead Sea after tests killed earlier hopes of a producer at 5,610 ft....Saboteurs were repulsed from Texaco's storage depot across the bay from Havana last week. The depot is near Esso Standard's refinery where last month rebels fired a gasoline tank.

Rubberized asphalt which may permit longer road-construction season in cold-weather states is being tested by Husky Oil Co. in Cody, Wyo.

Material was used to coat several streets in Cody when temperatures ranged between 28 and 35 degrees. The normal temperature minimum for asphalt-coating work is 50.

Husky reports rubber-asphalt surface has remained in good condition. Regular asphalt put on nearby street at the same time already is ridging and deteriorating.

Crude-oil production will hit it's peak of 9 million barrels daily in 1967 and thereafter decline.

That's the prediction of a new economic study (p. 105).

It's based on these factors: An average drilling return, maximum crude price of $4 per barrel, and producing capacity based on good conservation practices.

Time of peak producing capacity could be extended beyond 1967. But to do so would require crude-oil prices that are unrealistic.

Williston basin is still providing hot exploration news.

North Dakota has an apparent Red River Ordovician success in Divide County, 34 miles from production in the northwestern part of the state. Argo Oil and Kerr-McGee own the discovery well.

It could open vast Williston area to exploration stretching from Outlook field in Montana to Hummingbird strike in Saskatchewan.

Outlook field, meanwhile, is moving south.

Amerada's 1 State-F is an Outlook-Silurian producer, flowing 91 bbl. daily. The field now has 11 wells, making it the biggest pre-Madison field in Williston.

A spurt in drilling can be expected northwest and west of Aneth in Utah's portion of Paradox basin.

Reason is Shell's 24-5 Bluff Unit well. The test, a mile southwest stepout to the field discovery well, is good for 1,690 bbl. daily. It's third and best well in field.

This success should offset gloom of several failures.

Oil industry used more steel in 1957 than ever before.

This surprising tidbit from Iron and Steel Institute may surprise many suppliers currently having sales trouble.

Tonnage for oil reached 6,493,750, a 16 per cent gain over 1956 which also was a record year.

Drilling contractors will be hearing more about a new discount plan—f.o.b. the supply store.

AAODC directors have proposed such an idea be worked out between drillers and suppliers.

Drilling men want to pocket the savings if they transport items from the store to their rigs. Plan also could save suppliers by eliminating excessive number of visits to rigs by salesmen.

West Texas ranchers, plagued by drought, are benefitting from oil company shot-hole drilling techniques.

Because of drought, Shell crews have used air rather than water to blow cuttings out of shot holes. Thus any wet cuttings found denoted water-bearing sands below.

This information and technique was picked up by ranchers in locating water wells on their land.

Pipeliners are expecting substantial savings in electric-power costs from an electric variable-speed drive at pump stations.

Such a drive will be used for first time on a pipeline on the Cherokee products system from Ponca City, Okla., to Wood River, Ill.

The drive permits adjustment to varying pumping requirements caused by product or throughput changes. Also fixed losses from the variable-speed drive aren't as great as those across a throttling valve.

Market for high-energy fuels will hit a billion dollars annually within 10 years.

That's belief of Olin Mathieson, already a leading producer in the field.

Oil companies also are in the field and one reports an interesting insight into what's coming. Among solid fuels under consideration for nonair-breathing power plants are asphalt, wax, petroleum-derived plastics, and rubbers.

Petroleum, however, will hold its place in the engines and fuels of the future, says Texaco's G. W. Ferguson.

Many improvements are coming in the conventional spark-ignited automotive engine as well as in octanes and other qualities of gasoline, he says.

One industry customer—the Armed Forces—will buy less in fiscal 1958.

Buying will total 222 million barrels of products. That's a drop of 22 million barrels from last year.

Biggest cuts will be avgas, down 6 million barrels, and navy special, down 8½ million. Jet fuel will rise slightly.

Refiners might do well to examine the "MS" label on their crankcase lube oils.

The word in Detroit is that the auto industry is unhappy with loose grading of these lubes. The "MS" means a lube is designed to stand up under most severe automotive conditions.

One major car maker has tested a variety of lubes in its more severe engines of this year and last. Researchers found most of the lubes didn't stand up.

This could mean pressure for better quality grading. Also changes in manufacture and blending of certain lubes designed for the premium market may be ahead.

New hydrodesulfurization catalyst of improved activity is expected to be announced soon.

It will mark new progress in catalyst research. Its makeup was indicated by theory. This marks a departure from the old trial-and-error method of testing the almost infinite combinations of catalyst components to get the one which works best.

Good Wells Make Good News

A Monthly Report Of Successful Well Treatments

February 24, 1958

Fracturing treatments using acid-base fluids combine the advantages of acidizing and fracturing. When "tailored" to well conditions, these treatments often give a quicker payout, a slower decline, a larger drainage area, and greater ultimate recovery than either fracturing or acidizing alone. Here are some examples of recent Dowell acid-fracture treatments.

- **Young County, North Texas.** *Production was increased from a show to 12 bopd, stabilized,* when Dowell used Frac Acid*. The well was completed through perforations into the Caddo Lime (3966 to 3980 feet). It was treated down casing with 10,000 gallons of 10 per cent thickened acid and 10,000 pounds sand following a 500-gallon spearhead of Mud Acid. 20 ball sealers were used during treatment. Average injection-rate was 21 bpm at 2200 psi maximum.

- **Ector County, West Texas.** Production was increased from zero to 213 bopd, stabilized, after Dowell used Duofrac*. The treatment, which cost $7500, took less than four months to pay out despite stringent proration at 82 bopd. The well, completed in the Goldsmith Clearfork 5600 (5696 to 5736 feet) would not produce before stimulation. A four-stage treatment was used: (1) 500-gallon spearhead of Mud Acid, (2) 10,000 gallons fresh water with de-emulsifying agent, (3) 25,000 gallons 7½ per cent acid with de-emulsifying agent and 25,000 pounds sand, and (4) 10,000 gallons fresh water with de-emulsifying agent as a flush. *Potential after 35 days was 360 bopd. After 95 days, 273 bopd.*

- **Barber County, Kansas.** This well potentialed 7500 mcfd immediately after Acid Petrofrac*. A drill stem test showed no production before fracturing. Well was completed in the Mississippi Chat through perforations from 4625 to 4660 feet. After a drill stem test, 500 gallons of Mud Acid was injected slowly. Then well was treated with Acid Petrofrac. 20,000 gallons acid-crude oil emulsion, carrying 20,000 pounds of sand, was injected at an average rate of 29 bpm. *This is believed to be the only well in the area to become a commercial producer after such a poor drill stem test.*

- **Caddo Parish, North Louisiana.** Slim hole well potentials 1800 bopd in a field of six to 20 bopd producers. This well was completed in the Fredricksburg lime of the Bethany Field (2400 feet, 12 feet of perforation) using 2½-inch tubing as casing. Dowell used a 1000-gallon spearhead of 15 per cent regular acid, then Acid Petrofrac using 10,000 gallons acid-oil emulsion and 20,000 pounds sand. Injection averaged 6 bpm at 1700 psi. *Potential was stable at 1800 bopd sixty days after treatment.*

Many questions must be answered about your well if the best results are to be obtained. That's why your Dowell engineer keeps records on formation characteristics. That's why he sometimes asks for a sample of the formation or produced fluid before recommending a treatment. When he does get the information he needs, he can recommend a treatment tailored to your requirements.

For more information or service, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma.

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TECHNOLOGY—OPERATION

Drilling-Production

Special Section: United States' Future Productive Capacity . . . 105

By Warren Davis

This is a study of the factors affecting United States crude-oil production and reserves. This forecast differs from those previously published because it takes into account economic factors thought to be the most pertinent, in addition to the usual physical factors.

The method is designed to show the effect of changes in the economic factors. While this doesn't sharpen the accuracy of the results at a given time, it does permit continual revision to improve the accuracy of the forecasts.

Production and Drilling Practices in Venezuela . . . 132

By Harry L. Franklin and W. Doyle Miller

Production and drilling practices in Venezuela on land areas compare very favorably with the best in the United States. The major difference is that of fiscalization, official gaging by Venezuelan government representatives. This requires unusually large tank farms and storage facilities.

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NPSH and Centrifugal Pumps for Pipelines . . . 121

By Val Lobanoff

For pipelining work lower values of static head above vapor pressure (NPSH) are design goals for centrifugal pumps. Here is a discussion of the 14 variables which affect NPSH and the steps that users and designers are taking to lower the required values.

On The Job . . . Pipelining: Two Meter Proving Methods . . . 153

By M. L. Barrett, Jr.

The gravimetric method is best applied to permanent installations. The volumetric method involves the comparison of two meters.

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Relative Value of Crude in Refining Operations . . . 125

By N. R. Adams and R. C. Kersten

The time-honored practice of evaluating a crude for refining purposes on the basis of API gravity alone is unsatisfactory in the light of current economic factors. An engineering study is as necessary to crude evaluation as it is in determining the optimum processing scheme.

Low-Cost Alky-System Depropanizer . . . 139

By W. O. Webber

This unit efficiently removes propane from Humble's system at Baytown. Its special features are designed to depropanize condensed vent gas from the refrigeration compressor condensate accumulators. Chief advantage: higher propane concentration, thus low-cost design and operation.

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Here's proof of the solubilizing power of FOA-2

Du Pont Fuel Oil Additive No. 2 has long been known as an exceedingly effective fuel oil stabilizer, sludge dispersant and solubilizer. These qualities have been repeatedly demonstrated in field performance, and now the solubilizing power of the additive can be demonstrated in the laboratory as well.

The demonstration is quite simple and can be made with no more equipment than a heat source (steam bath) and two small vials of fuel. The fuel is kerosine with a small amount of benzene containing dissolved sludge. FOA-2 is added to one of the fuel samples; then the benzene is boiled off of both samples. The time-lapse pictures at the right tell the story.

How FOA-2 solubilizes

The photos show that at the beginning sludge is soluble in the fuel, becoming insoluble only when the aromatic solvent portion (benzene) is removed. The right-hand bottle shows that FOA-2 keeps the sludge soluble, whereas it gradually precipitates in the bottle at left.

FOA-2 is a long-chain polymer with a critical balance between polar and oil-soluble groups. The polar groups are attracted to non-hydrocarbon constituents or residue particles, and the soluble groups maintain good oil solubility of the combination.

FOA-2 *stabilizes* fuel by preventing interaction of non-hydrocarbon constituents or residue formers in the fuel. It *solubilizes* some residues which are just slightly insoluble, and *disperses* other residue particles which are quite oil-insoluble.

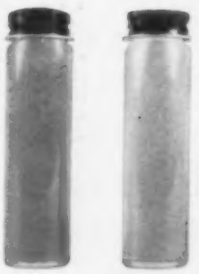
Benefits of the additive

These three properties of Du Pont Fuel Oil Additive No. 2 keep oils free flowing . . . devoid of sludge which could cause clogging of heating systems.

They are responsible also for FOA-2's solution of the incompatibility problem. The sludge likely to precipitate when oils are mixed does not form if sufficient FOA-2 is present; 30 lb./1,000 bbl. is usually enough to prevent incompatibility.

The third important function of the additive is its cleansing of systems already fouled with sludge. This saves the costs of downtime and of having systems cleaned manually.

1. 10:30 a.m., September 23, 1957: These bottles both contain 99% kerosine, 1% benzene and a small amount of sludge (15 mg/100 ml) which is soluble in the fuel blend. To the bottle at right 0.01% of Du Pont FOA-2 has been added. This is the proportion recommended for protecting fuel oils (30 lb./1,000 bbl.).



2. 10:42 a.m., same day: The samples have been heated for 10 minutes in boiling water to evaporate the benzene. Sludge is already starting to appear in the bottle at left, not in bottle at right.

3. 11:42 a.m., same day: Note in cut 3 agglomeration of insoluble sludge particles at left, and clarity of FOA-2 protected oil at right.

4. 1 p.m., same day: Some sludge has settled to bottom. Solution at right remains clear.

5. 10:30 a.m., next day: Most of the small sludge particles in left-hand bottle have now settled. After 24 hours, FOA-2 protected oil still shows no sign of sludge precipitation, and will continue clear almost indefinitely.

New book about FOA-2

We recently published a comprehensive 28-page book about FOA-2. All the basic information you will need is included—properties, composition, use concentrations, handling and addition methods, and performance testing data. Ask any of our representatives for a copy, or drop us a line.

* * *

WILLIAM T. ROBINSON is head of the group at the main Du Pont Petroleum Laboratory engaged in technical work on gasoline and fuel oil additives. For the past five years, he has been closely associated with the development and application of Du Pont FOA-2. In addition to his activities at the Laboratory, he has worked closely with refiners on the effective use of this additive.

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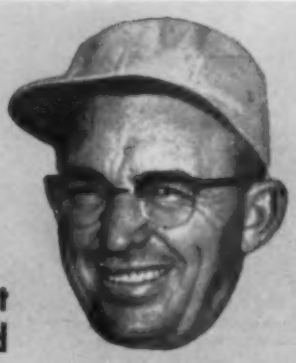

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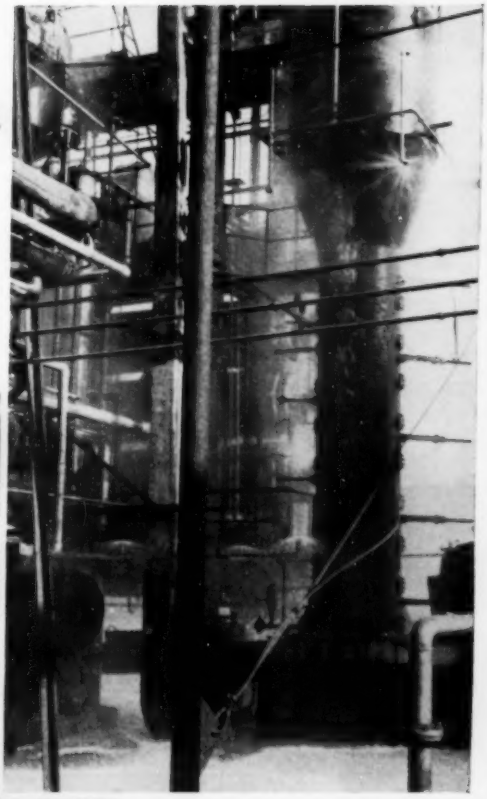
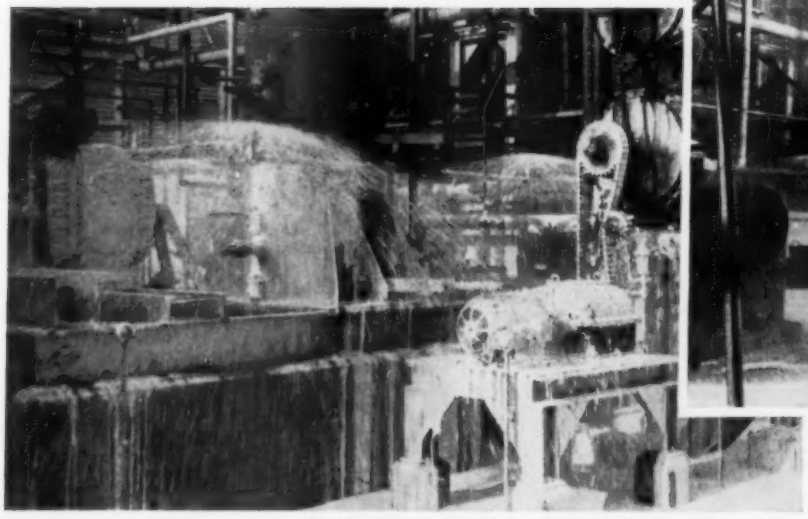
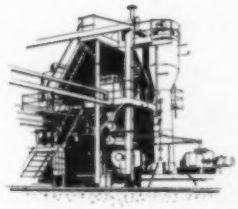


▲ Grinnell ProtectoSpray on upper part of unit cools equipment and washes burning oil and solvent into area protected by foam blanket below.



▲ Grinnell ProtectoFoam safeguards the lower section of hexane solvent extraction unit with a blanket of foam, to prevent formation of explosive mixtures.



At Canadian Vegetable Oil Processing Ltd., Hamilton, Ontario, hexane solvent is used in extracting vegetable oil from soybeans. Because of the highly flammable nature of the solvent, Grinnell designed a special system for this unit, consisting of 162 ProtectoSpray nozzles — to drench the superstructure with fine water spray; and 24 ProtectoFoam spray heads — to blanket the diked area with foam. This water-foam combination protects the lives of personnel, as well as shielding equipment from costly damage.

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FATIGUE RESISTANT

—standard on LINK-BELT oil field roller chain

U. S. Patent No. 2,517,497

Fatigue Resistant processing of sidebars develops greater dynamic strength for hard-working oil field drives . . . increases endurance limit

No ordinary roller chain can long withstand the brute punishment of drilling service. That's why Link-Belt adds the FR process—a proven way to promote longer chain life. By compressing the metal around pitch holes, Link-Belt greatly strengthens the critical sidebar areas most vulnerable to fatigue . . . thus creating extraordinary *dynamic strength.*

And FR is just one of many Link-Belt "extras":

- SHOT-PEENED ROLLERS
- SHEPHERD'S CROOK COTTERS
- PRE-STRESSING
- CLOSER HEAT-TREAT CONTROL
- E-Z ASSEMBLY
- DOUBLE BOXING

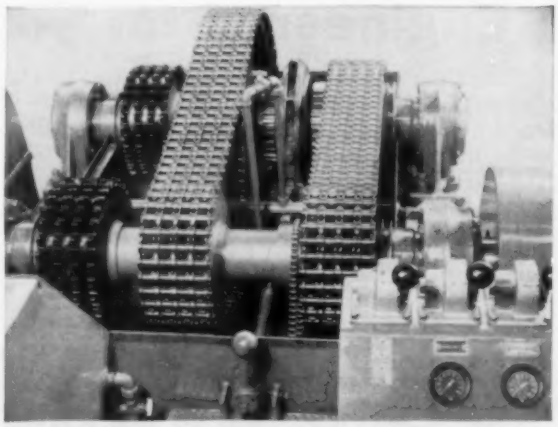
Any leading supply store in the field can give you full details and a copy of Link-Belt Catalog 2780.

LINK-BELT

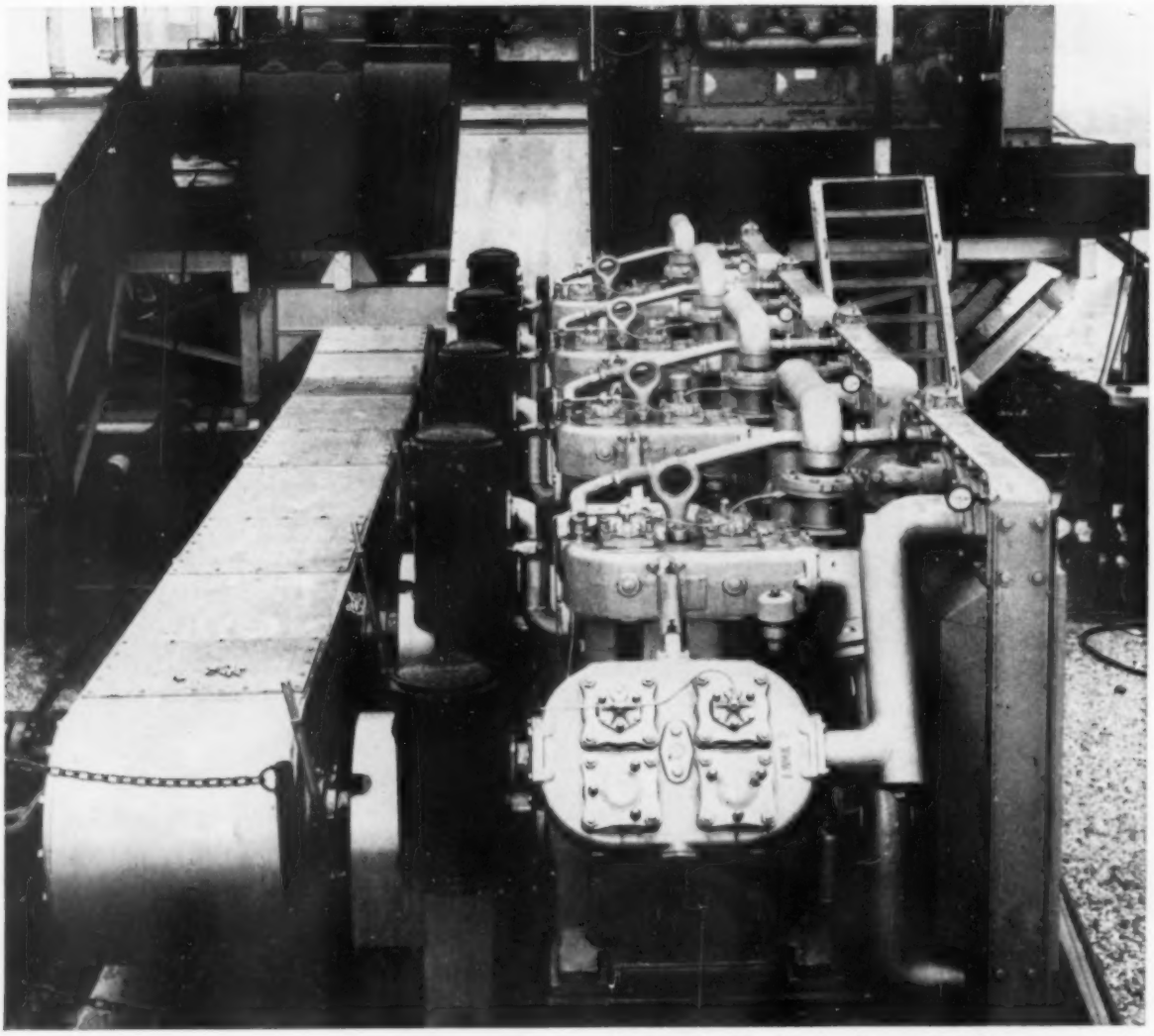
ROLLER CHAINS & SPROCKETS

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Shreveport, La., Los Angeles 22, (Montebello), Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields.

14.672



NATIONAL DUAL-ENGINE INDEPENDENT PUMP DRIVE incorporates quadruple-width Link-Belt Precision Steel roller chain with FR. *Since this feature involves no alteration in dimensions of chain parts, Link-Belt roller chain is interchangeable with standard chains and sprockets.*



An assembly of four Gardner-Denver WBK-C4 compressor units.

Engineered for your air drilling needs

Is your air drilling project in the planning stage? Here's a compressor package designed especially for it—the Gardner-Denver WB air drilling unit. Each packaged unit consists of water-cooled compressor, intercooler and aftercooler, engineered to deliver cooler air at the header. The WB is built for continuous service and is easily maintained at the drilling site.

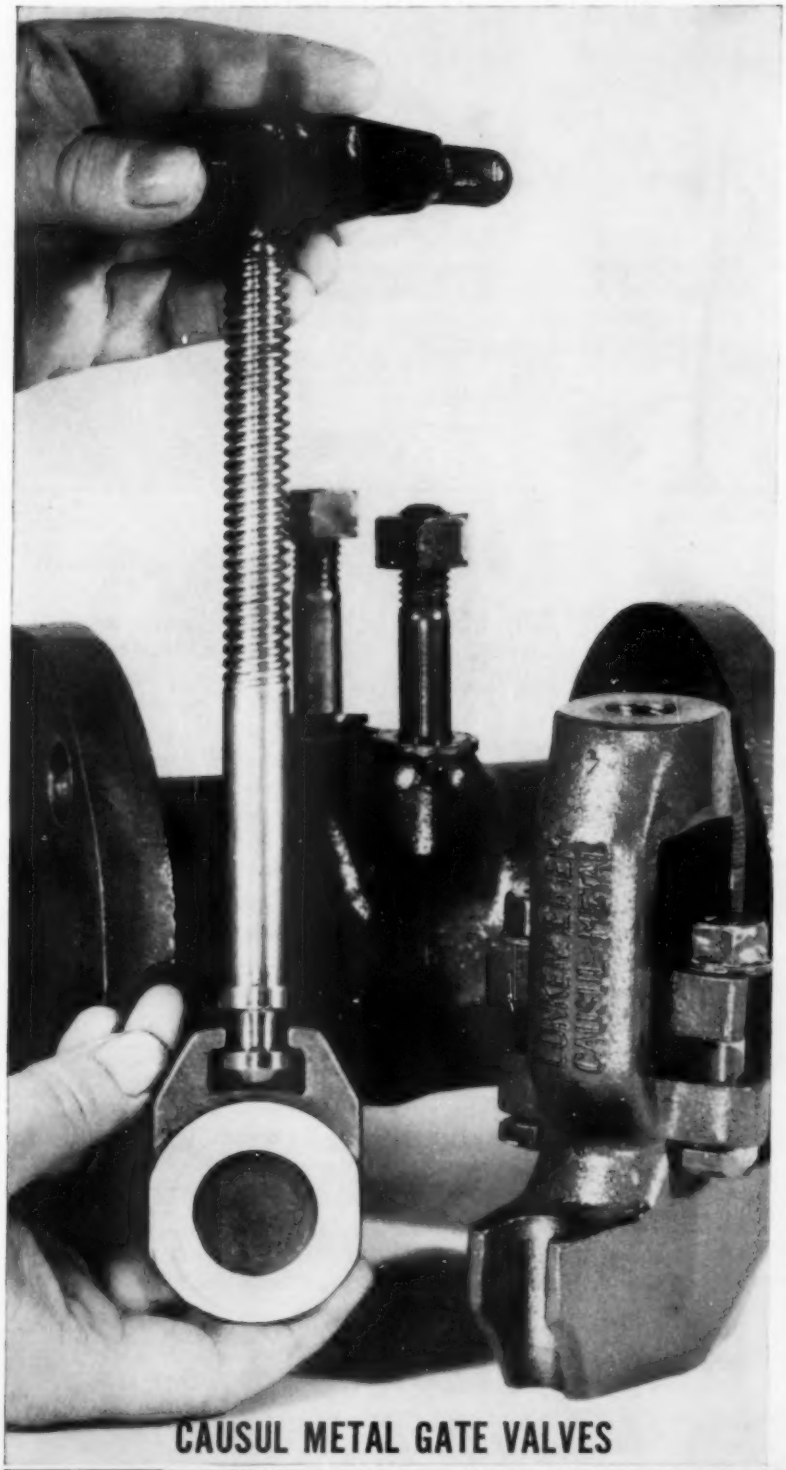
Gardner-Denver has the facts

Get in touch with your Gardner-Denver compressor specialist. His knowledge of circulation problems is backed by three generations of Gardner-Denver service to the drilling industry. He can help plan the correct installation for any air drilling or mud aeration application. Gardner-Denver compressor specialists are located throughout the oil fields.

ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario
Gardner-Denver Export Division, 233 Broadway, New York, N. Y.
Oil Field Offices: Dallas, Houston, Tulsa, St. Louis, Los Angeles, New York, Pittsburgh, Denver, New Orleans, San Francisco, Kansas City, Winnipeg, Edmonton



CAUSUL METAL GATE VALVES

"HIGH ALLOY" Performance at Iron Valve Costs

CAUSUL METAL GATE VALVES *by* LUNKENHEIMER

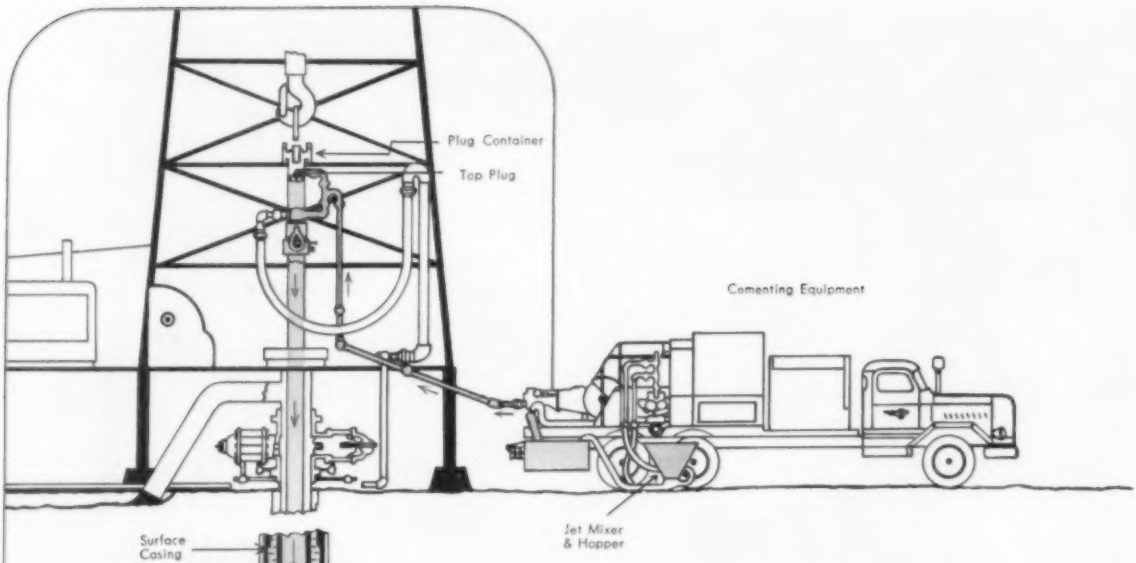
"Causul" Metal Valves offer *balanced* corrosion-resistance, yet cost far less than expensive high alloy valves. "Causul" Metal bodies and bonnets are teamed with Stainless Steel or Monel seats, discs, and stems to give maximum resistance to corrosion at the lowest possible cost. Heavy, thick body walls provide extra strength and durability. For full details on the maintenance-saving features of "Causul" Metal Valves, call the Lunkenheimer Distributor in your area. He will be glad to show you how you can keep valve maintenance costs down without investing in premium priced high alloy valves. . . . Or write The Lunkenheimer Co., Cincinnati 14, Ohio.

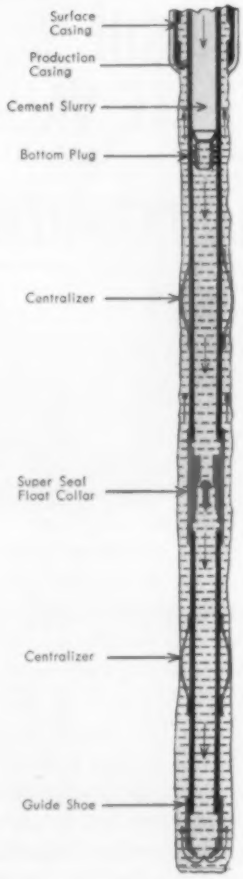
L-1154

LUNKENHEIMER QUALITY

LUNKENHEIMER®

THE ONE *Great* NAME IN VALVES



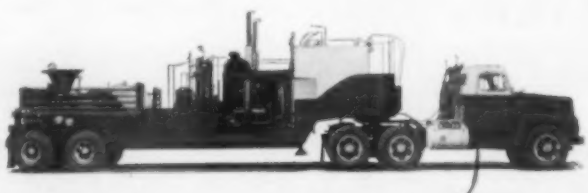


WHAT IS PRIMARY CEMENTING?

Primary cementing is the initial operation performed immediately after casing is run into the hole. It serves the basic functions of bonding pipe to formations, aids in protecting oil and gas zones and preventing migration of fluids within the well.

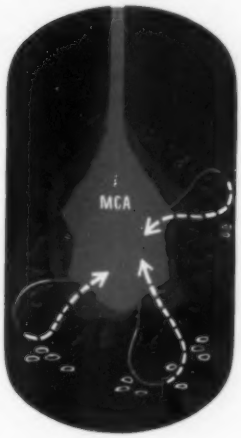
In primary cementing, the slurry is pumped out of the bottom of the lower shoe into the annular space outside the casing, as illustrated in the operational diagram at the left. A good primary cementing job is one of the most important factors affecting the producing period and the settled production rate of any oil well.

Get longer producing life... greater protection against subsurface problems... more net BOPD from your well. Specify Halliburton for your primary cementing!



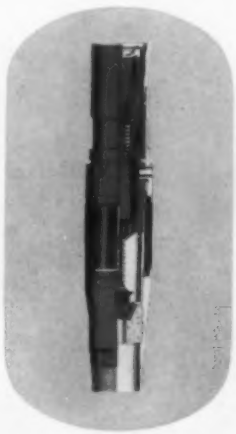
HALLIBURTON
OIL WELL CEMENTING COMPANY
DUNCAN, OKLAHOMA

FOR MORE PRODUCTION, USE THESE HALLIBURTON PRODUCTS TO ASSIST YOUR WELL:



MCA, Halliburton's effective Mud Clean-out Agent, is used ahead of the cement slurry in primary cementing. Laboratory tests indicate that MCA is the most efficient mud dispersant available. It helps to clean out mud and soft filter cake in the annular space, reducing the possibility of channeling and providing a better cement bond to the formation.

FORMATION PACKER COLLAR is installed on casing above the shoe joint to help protect a lower formation from contamination while cementing. Several joints of casing or liner may be installed on lower end of packer collar; the packer is set and cement pumped down casing and out into annulus above expanded packer.



FORMATION PACKER SHOE, installed on the first joint of a string of casing, offers many advantages. This shoe is used in all areas where conditions require casing to be set on top of the producing formation, because:

1. Packer Shoe packs off open hole below casing, protecting low-pressure formations from cement contamination during cementing.
2. Packer Shoe floats in and guides casing to bottom.
3. Packer Shoe has a Super-Seal Back-Pressure Valve to keep cement slurry from backing up inside the casing above the Formation Packer Shoe.
4. Packer Shoe provides circulation of fluids through end of Shoe until shoe packer rubber is expanded and set.

STANDARD MEASURING DEVICE *for:*

- Determining accurate measurements of well depths.
- Running instruments to obtain bottom hole temperatures, pressures, and fluid samples.
- Running crooked hole survey instruments.
- Surveying offshore locations that require precise linear measurements.

In addition to the Standard Measuring Device, Halliburton offers Heavy Duty, Extra Heavy Duty, and Super-Duty Devices. Whatever your needs, Halliburton has the device or combination of equipment to meet them.

HOWCO HYFLO, an emulsion breaker, effectively removes water blocks and emulsions from productive formations, permitting oil to flow to the well bore with less resistance. Howco Hyflo is a surfactant which acts by greatly reducing the interfacial tension between the water and oil and minimizes the existence of stable emulsions.

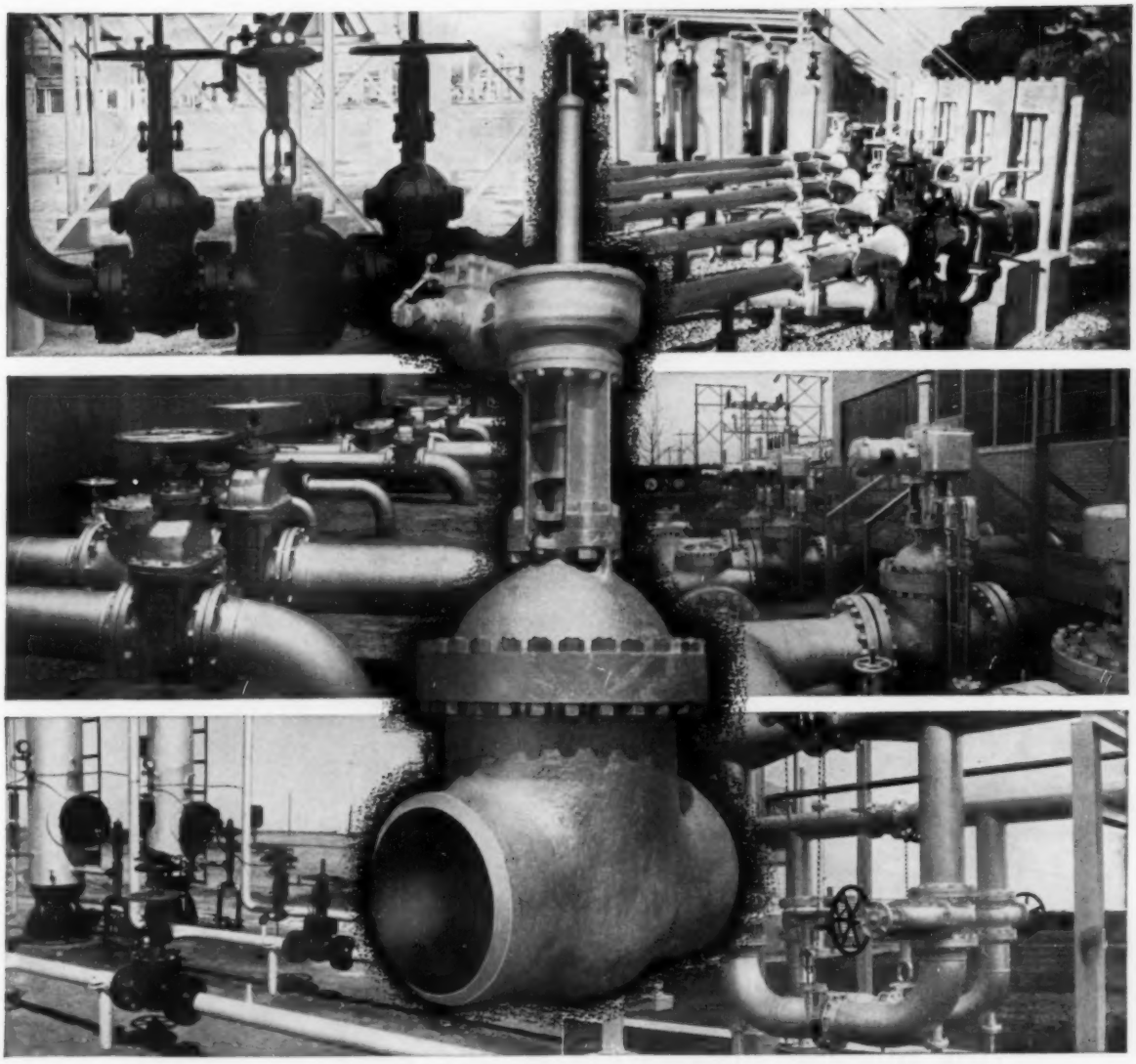
CEMENTING SERVICES

284 SERVICE CENTERS—JUST MINUTES AWAY FROM YOUR WELL

5802

CF&I SEAMLESS casing and tubing AP

THE COLORADO FUEL AND IRON CORPORATION • DENVER, COLORADO



Unmatched advantages whatever the service . . . with

Darling Fully Revolving Double Disc Parallel Seat Gate Valves

ALL the Darling gate valves shown here, from the large 30″ main line valve to small 4″ loading pump valves share identical multiple advantages. They operate with the positive yet easy closure . . . the uniform wear distribution . . . the elimination of disc-to-seat galling . . . the adjustment for valve body distortion . . . the minimum, simplified maintenance and the extended, trouble-free service life made possible by the well-proved fully revolving double disc gate principle perfected by Darling.

Why not check into Darling gate valves for your next requirements? Find out *how* they assure all these advantages . . . and let us give you proof! Write for Catalog No. 57.

DARLING VALVE & MANUFACTURING CO.
Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

DARLING VALVES

Did You Ever See a Double Headed Pump?

This unusual installation is operated by Low-Cost Utility Electric Power

Pumping from different depths but through the same casing, these pumps can be operated simultaneously or singly. Each is operated by AUTOMATICALLY CONTROLLED push-button power – ELECTRIC POWER.

While such installations are not common, it is standard procedure in most fields today to utilize Utility Electric Power because of the overall LOWER COST, greater efficiency, and numerous special benefits.

For helpful counsel on how you can benefit, call the Power Engineer of your Utility Electric Service Company.

I'm LCP – Low-Cost Power
ON THE JOB – 24 HOURS DAILY.

PETROLEUM ELECTRIC POWER ASSOCIATION
P. O. BOX 35006 DALLAS, TEXAS

SOLVO®

NEW PARAFFIN REMOVER CONTAINS NO ORGANIC CHLORIDES!

why chlorine-free SOLVO is important to producer and refiner

The organic chlorides found in most chemical paraffin removers remain in the crude—following it to the refinery where they adversely affect the performance of the catalysts used in catalytic reforming. Refinery tests show that as little as 5 gallons of paraffin "solvent" of this kind can contaminate as much as 30,000 barrels of crude, and affect the over-all refinery operation. *SOLVO contains no components which will adversely affect refinery operations.*

Paraffin accumulations such as these plug wells and flow lines, and rob operations of top dollar-efficiency. *SOLVO* has been designed to *prevent* such deposition and eliminate the necessity for frequent pulling and steaming jobs!

how SOLVO is used

SOLVO is available in a variety of formulas; most of which are dispersible in both oil and water, and may be used in either type of diluent. Such dispersions may be relatively concentrated or as dilute as 1%. SOLVO has a high flash point and low vapor pressure, making it safe to use.

effective wherever crude petroleum is produced, transported or stored

Whether your paraffin problem is in a pumping well, tank or flowline, SOLVO works quickly, efficiently, inexpensively. Your local Tretolite Service Engineer is ready to show you how to get the most successful results from this and any other Tretolite product.

TRETOLITE COMPANY

DIVISIONS OF PETROLITE CORPORATION

369 Marshall Avenue, Saint Louis 19, Missouri
5515 Telegraph Road, Los Angeles 22, California

Chemicals and Services for the Petroleum Industry

DEMULSIFICATION • DESALTING • CORROSION INHIBITING • PARAFFIN REMOVAL • SCALE PREVENTION
WATER DE-OILING • INJECTIVITY STIMULATION

TPR-58-2

WANT MORE INFORMATION?

Write to nearest headquarters for Illustrated Brochure.

TRETOLITE COMPANY
Divisions of Petrolite Corporation
369 Marshall Avenue, St. Louis 19, Missouri
5515 Telegraph Road, Los Angeles 22, California

Gentlemen: I'm interested in SOLVO, your new chlorine-free paraffin remover. Send me new illustrated brochure.

NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

. . . here's why

CHECK THESE FACTS!

INTEGRITY OF MATERIALS

Farris metallurgy of parts offers as *standard*, stainless steel, rather than carbon steel in critical locations; and use of hardened parts for highest valve operating efficiency.

MINIMIZED SPARE PARTS INVENTORY

Since 1945 every new Farris part has been interchangeable with former parts, keeping inventories at minimum . . . with parts low priced!

NO OBSOLESCENCE OF DESIGN

Construction improvements — not repeated design changes — have resulted in user recognition, standardization of design; eliminating confusion and expense to the customer.

UNEQUALLED QUALITY AT COMPETITIVE PRICES

Freedom from changing inventory, new pattern problems and continuous new tooling permits lowest production costs, passed on to the user in lowest valve costs.

LICENSED TO OTHERS

In the Industry's interest, limited licensing arrangements were granted . . . A Farris patent number is your protection.

PROVEN SAFE PERFORMANCE

The complete dependability of Farris valves has been proven by 13 years of use in the field, under all service conditions.

Meets ASME-NB Requirements for ASME Unfired Pressure Vessel Code, Section 8 and ASME Power Boiler Code, Section 1.

Send for the NEW Farris Engineering Catalog. A complete, detailed listing of Farris Process Safety and Relief Valves, plus useful information to help you select the proper valve for your requirements.

Farris®

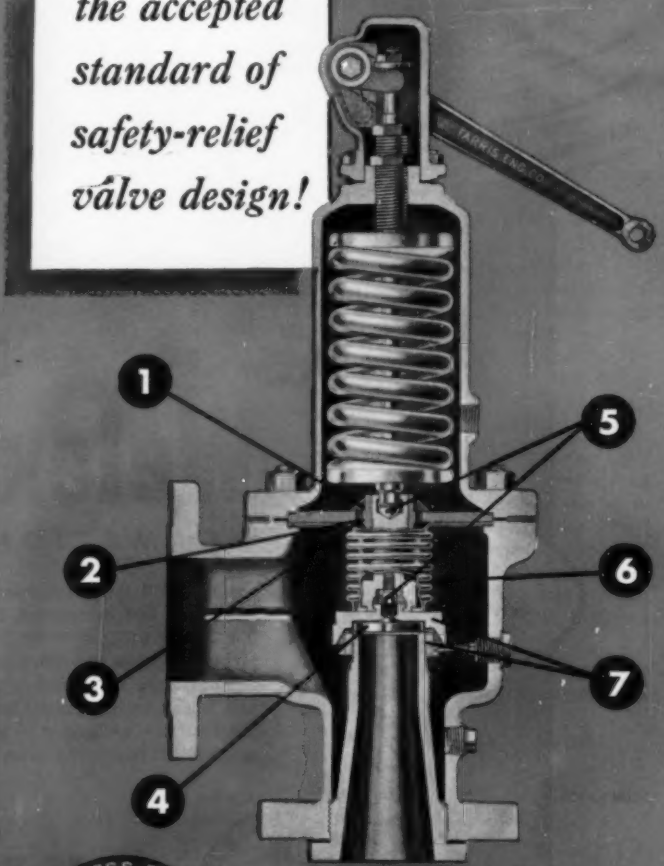
SAFETY-RELIEF VALVES

are your best buy

the accepted standard of safety-relief valve design!

Farris gave industry the ideal concept of a trouble-free, safe, safety-relief valve in 1945... and it has had little need for major design changes through the years. The proven excellence of design and construction has resulted in patent licensing to others, serving to reduce a confusion of designs which retarded the safety valve industry in prior years. Today, the Farris design—with or without its universally accepted optional "BalanSeal" bellows—represents the *standard* of the industry... it has been the standard for over 13 years.

With Farris valves in your process lines you'll know that another confusing design change isn't around the corner to plague you... you'll never worry about obsolescence of your spare parts inventory... you'll always benefit by integrity of materials in valve construction. You can be sure of all this because Farris full-performance valves have proven to be the *accredited leaders* in the field of safety.



1. 2½ to 1 ratio—guide length to guide diameter—prevents galling and hanging up.
2. High thermal expansion rate of sleeve guide and low thermal expansion rate of hardened stem retainer eliminates binding and galling even at elevated temperatures.
3. Sleeve guide provides solid baffle between body and bonnet, shielding spring from leading fluid.
4. Hardened stainless steel optically lapped flat disc—self aligning for maximum tightness.
5. Double universal ball joint from stem to disc for self alignment—eliminates effects of spring, temperature and piping distortion.
6. Stainless steel stress relieved "BALANSEAL"® bellows nullifies effect of back pressure and isolates internal working parts from leading fluid.
7. Cone-shaped disc holder directs flow away from guiding surfaces and forms fixed secondary orifice with single blowdown ring control for built-in capacity.

PROGRESS THROUGH HONEST PURPOSE

Farris ENGINEERING CORP.

527 Commercial Avenue, Palisades Park, N. J.

In Texas: 5400 Clinton Drive, Houston 20

Main Office
Palisades Park, N. J.
Windsor 4-6300

Texas Plant
Orchard 2-7557

affiliates:

FARRIS FLEXIBLE VALVE CORPORATION
FARRIS PICKERING GOVERNOR CO., INC.
FARRIS HYDROTORQUE CORPORATION
FARRIS HYDROSEAL CORPORATION

Controlled Fissuring Power!

Welex BEAR GUN

(FORMATION FRACTURING TOOL)

The gun that shoots 'round a corner!

Welex called this mighty innovation the Formation Fracturing Tool when they developed and introduced it two years ago — you, in the field, gave it a new name after using it — the Bear Gun. By any name — oil operators everywhere are calling more and more for the tool's great fissuring power in their tough wells. Wherever the formation or a heavy invasion of mud or cement hinder the flow, call Welex for the Bear Gun. Each shot will give you a large entrance hole — deep into the formation — and the extensive fissuring that reduces pressures and makes your fracturing job a success!

ORIGINATORS OF Welex JET PERFORATING

WELEX, INC.

General Offices: 1400 East Berry, Fort Worth, Texas • Division Offices in Dallas, Denver, Houston, Los Angeles, Midland, New Orleans, Tulsa and Wichita • District offices in every major oil center • Subsidiaries in Canada, Peru and Venezuela.

With Magcobar on your well ...

you get full laboratory backing wherever you drill

"Get this sample to the laboratory as fast as possible." And by fast plane or car, the mud sample, packed in an air-tight stainless steel container, is rushed to the Magcobar laboratory. The laboratory works on a 24-hour basis when the emergency is your well. You get the precise information needed to keep drilling.

In many problem wells there is simply no way of obtaining the data needed for proper action at the well site. For example, you can't check for all chemical ions by simple titration, but with the spectrophotometer the right answer can be arrived at in minutes. In the laboratory complete chemical analyses of the mud can be made quickly and the physical properties studied at various pressures and temperatures.

This is the emergency work the laboratory does, backing up and supporting the field engineer. Just as important is its day in and day out job of developing new drilling chemicals, evaluating their effectiveness in the field, helping you in many ways to cut drilling costs through an engineered mud program.

Wherever you drill you benefit from the Magcobar Laboratories. So, make sure you get the best. Plan with Magcobar on your next well.

Magnet Cove Barium Corporation
Houston, Texas

Magcobar
Complete
DRILLING MUD SERVICE

58—102

AAF Type W Cycoils assure clean air to gas compressors at this field processing plant of the Odessa Gasoline Company in Ector County, Texas.

AAF Cycoils protect compressor equipment day-in-day-out— require little maintenance

Why are AAF Cycoil oil bath air cleaners used for so many unmanned pumping stations and automatic plants? The reason is simple: Cycoils are known and *trusted* for dependability and efficiency. What's more, they require only infrequent maintenance because filter pads are self cleaning. Periodic replacement of oil is all that's required.

Cycoils' method of intermixing oil and dust-ladened air traps 90% of the fine dust particles before they ever reach the final filter pads. That's why Cycoil-cleaned air is virtually 100% dust-free!

Whether it's a pulsating action or smooth flow application, involving packaged or stationary compressors, there's a Cycoil of a type and capacity to meet your needs. Write today for bulletins describing the complete line of Cycoil oil bath air cleaners.

AAF
Herman Nelson

American Air Filter
COMPANY, INC.

444 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

Type CMS Multi-Duty Filters

Type G Pipeline Air Filters

— BETTER AIR IS OUR BUSINESS —

Type OCH Intake Air Filters

Cycoil Oil Bath Air Filters

are you pumping red tape?

If you are there's no quick, easy solution to your problem. But an answer must be found. The red tape of oil operation can choke production as surely as a well that is sanding up. These higher operation costs can cut your profit to the point that you are working only for your creditors.

Although you have no control over your sales price, you can control your costs. Working with your legal and tax counsel, The Commerce can analyze your costs, find where economies can be effected, thereby increasing the profitableness of your operation by helping you to cut your costs. Your income goes up when you stop pumping red tape.

Facilities of The National Bank of Commerce Oil Loan Department are available in Wyoming, Nebraska, Colorado, New Mexico, Texas, Louisiana, and Mississippi.

E. O. Buck, vice president, Oil Loan Department

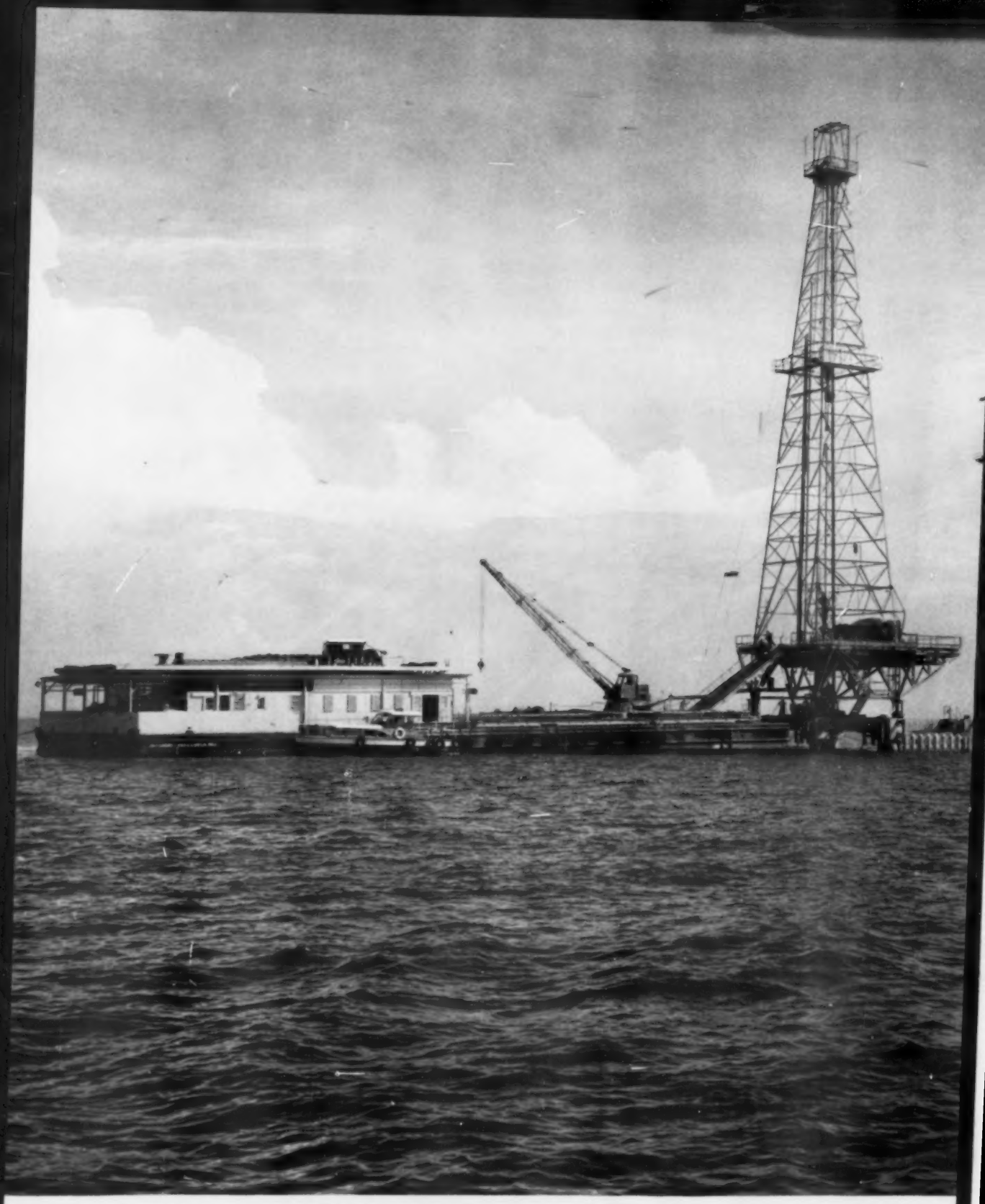
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

THE NATIONAL BANK OF

COMMERCE

OF HOUSTON

Gulf Building, Houston, Texas



Drilling in Lake Maracaibo is The Offshore Company's new barge V-1. Barge V-2 is also working in this area. These units are the most powerful Diesel-electric rigs yet to work in Venezuela. Each is capable of drilling in excess of 12,000 feet.

The Offshore Company Goes to Venezuela

—picks Electro-Motive Power with overseas service and parts facilities for two new Diesel-electric barges

The Offshore Company, first to use Electro-Motive Power in the United States, is now first to use this Diesel-electric equipment in Venezuela on their new barges, V-1 and V-2.

Each of these modern barges contains Electro-Motive equipment of 2700 horsepower, making them the most powerful Diesel-electric rigs sent to work in the Lake Maracaibo area.

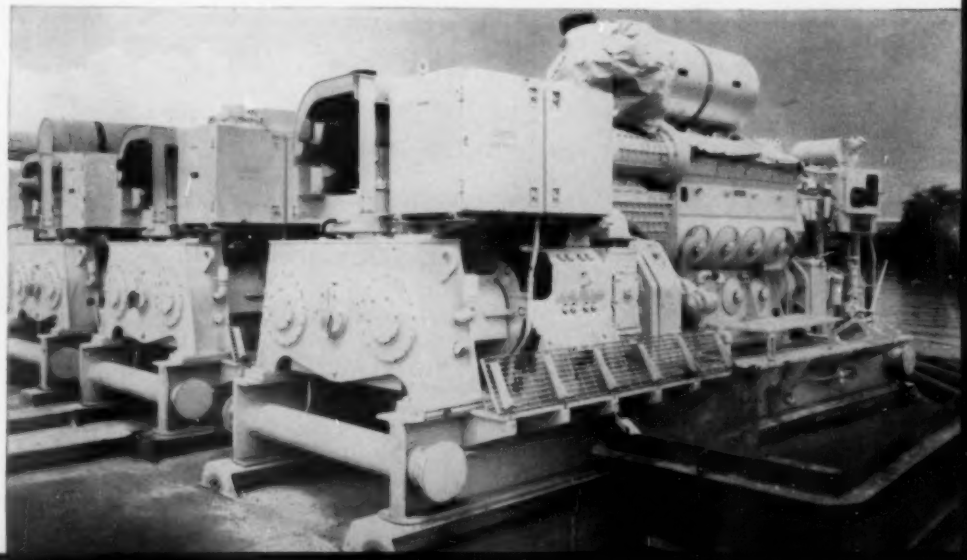
Behind The Offshore Company's choice of power for the new barges was experience with Electro-Motive Power on their record-breaking mobile platforms Nos. 54 and 55 and their fixed platform No. 25. But most important was the knowledge that they could get *local* service for Electro-Motive equipment from General Motors de Venezuela.

Factory-trained personnel head up this facility through General Motors Overseas Operations. It offers the same superior service for Electro-Motive equipment found in the Gulf. Here too, complete facilities are offered for both engine and electrical components—*one responsibility* for the complete power system.

If your interests lie in moderate or deep drilling in this country, Canada, South America, or elsewhere, look into the advantages of Electro-Motive equipment with established world-wide service facilities. See your Electro-Motive representative for details.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS · La Grange, Ill.

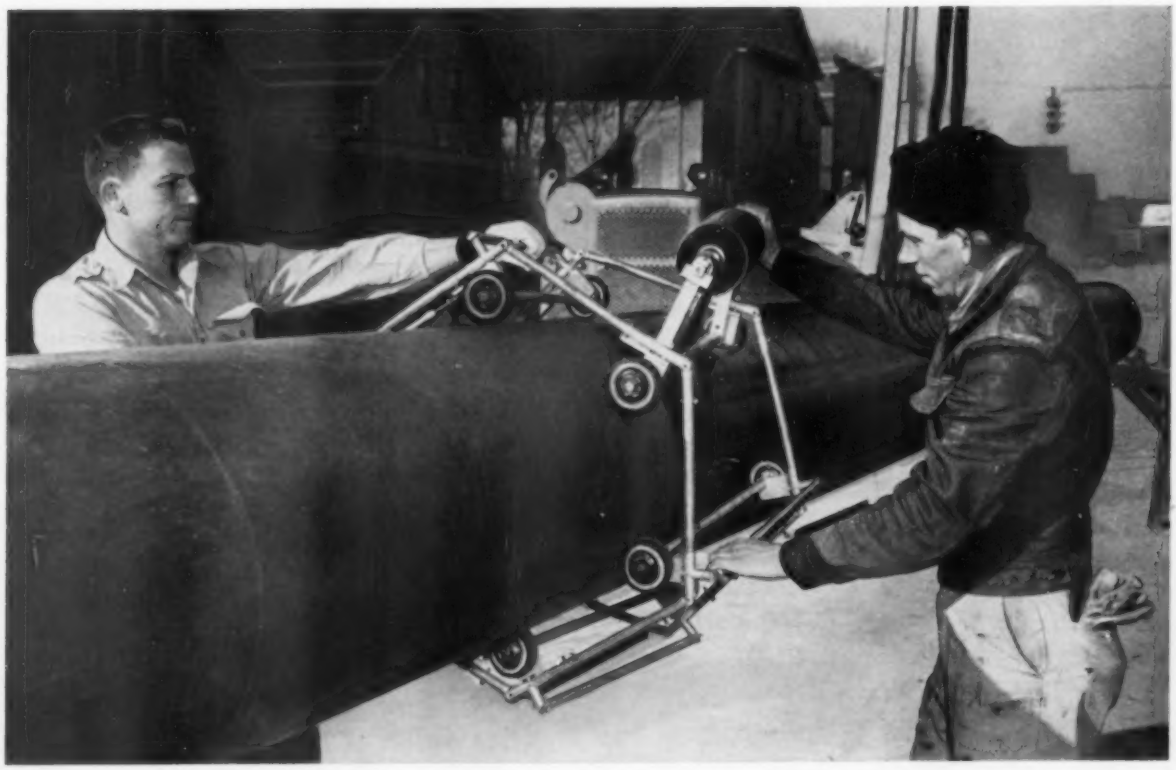
In Canada: General Motors Diesel Limited, London, Ontario
Petroleum industry sales offices: Dallas and Houston, Texas; Morgan City, Louisiana; Los Angeles, California.



Three Electro-Motive engine-generator sets of 900 hp each supply power to drive motors on mud pumps and draw works. These sets are heat-exchanger cooled. Sets are also available with air cooling or keel-cooling systems.

THE MODERN TAPE...AT WORK FOR MODERN INDUSTRY

20-inch gas main site-wrapped with versatile Polyken® tape



Upper New York State utility company turns to Polyken tape to get the job done fast...and sure...in congested areas

This is the tape that's making big-inch pipeline news this year. Made of tough, inert polyethylene, Polyken tape offers proven protection against the corrosive effects of moisture, soil chemicals and electrolytic current.

And here, on a site-wrapping job in a congested city area, it provides another major advantage: *simplicity of application.*

Tape saves headaches

You know the complications of using a hot coating in a place like this. Easy-to-apply Polyken tape does away with these problems. It goes on, as you see, right off the roll—without heat, liquids, solvents or thinners. Saves time, labor and equipment costs.

Now you know why more and more utility companies are turning to site or over-the-ditch wrapping for their distribution lines with time-tested, time- and money-saving Polyken tape.

For further information, write to the Polyken Sales Division, 309 W. Jackson Blvd., Chicago 6, Ill.

Polyken®

Experienced in modern PROTECTIVE COATINGS

THE KENDALL COMPANY
Polyken Sales Division

The "Cone Nebula" in the constellation of Monocerus photographed through the 200-inch Hale telescope of the Palomar Observatory. This mass of stars is about 1,000 light-years, or roughly six million billion miles from the earth.

MEASURING THE UNSEEN

Although attempting nothing so spectacular as measuring unseen stars through a 200-inch telescope, Tuboscope research is paying off for oil men everywhere. From Tuboscope research have come new instruments for measuring the nearly unseen effects of wear, fatigue, and corrosion in oilfield tubular goods. And from Tuboscope experience in the field comes the ability to inspect and to grade your tubular goods with the greatest possible precision and with the least chance for human error. The important factors of bottom hole pressure and temperature are measured by Tuboscope's Subsurface Engineering Division.

2919 HOLMES RD. • HOUSTON, TEXAS

Tuboscope COMPANY

CENTRALIZED CONTROL in convenient, easily accessible location affords one operator automatic operation of the drive system.

AT TENNESSEE GAS TRANSMISSION COMPANY . . .

New Compressor Station

DEPENDABILITY of General Electric gas turbine makes single-unit stations reliable, practical. Base-mounted turbine saves time, money in installation and station construction.

SAVINGS on installation, maintenance, and operating costs were the result of close co-operation between Tennessee Gas Transmission Company personnel and General Electric engineering services.

FACTORY ASSEMBLED General Electric Cabinetrol* panels afford centralized control of all station auxiliary equipment. Compact design requires minimum of station's valuable floor space.

Starts Up in Record Time

GENERAL ELECTRIC'S COMPLETE ENGINEERING SERVICES ORGANIZATION WORKING CLOSELY WITH TGT ENGINEERS FACILITATED INSTALLATION AND "START-UP" OF A G-E GAS TURBINE AT TGT'S SAVANNAH STATION IN RECORD 27 DAYS

Twenty-seven days after unloading its General Electric gas turbine, Tennessee Gas Transmission Company's new Savannah, Tenn. station was in operation. This record installation time was made possible through close co-operation between TGT engineers and General Electric's complete engineering services organization.

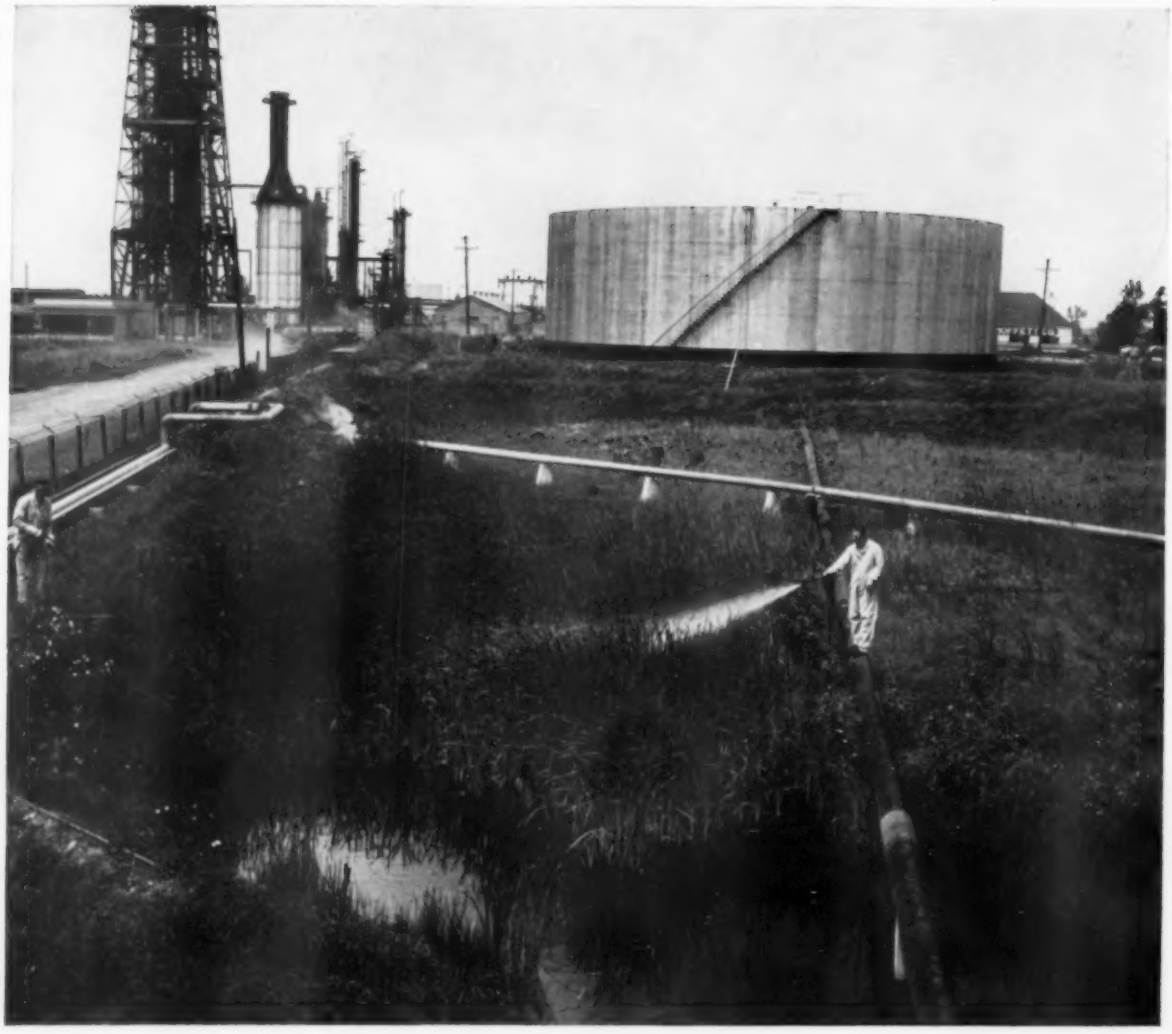
FROM DESIGN STAGES through application engineering, manufacture, installation, and operation, General Electric's wide experience in this field was utilized by TGT. The result was a drive system that exactly meets the particular station requirements of TGT.

DEPENDABILITY of all General Electric station and auxiliary equipment means a big dollar savings in terms of costly space, stand-by units, and emergency downtime.

TO HELP SOLVE YOUR STATION DRIVE REQUIREMENTS, General Electric makes available to you these complete engineering services. As with the Tennessee Gas Transmission Company installation, G-E engineers will co-operate closely with you in helping to design and install the drive system that exactly meets your station requirements. Get complete information from your nearest General Electric Apparatus Sales Office and meanwhile write for Bulletin GEA-6401, Combustion Gas Turbines, to General Electric Company, Section 661-56, Schenectady, N.Y. *Reg. trade-mark of General Electric.

Engineered Electrical Systems for Pipeline Pumping

GENERAL ELECTRIC



Weeds are a hazard you can't afford!

Destroy them with Baron, Radapon and other Dow weed killers

Weeds are a nuisance. They clog drainage ditches, block access to valves and operating equipment, make your property unsightly. But worst of all, weeds create a dangerous fire hazard around tanks and pipelines. One match dropped thoughtlessly along an outside fence can send flames leaping through dry weeds toward storage tanks and valuable equipment. Result—fire losses running into thousands of dollars.

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Baron®, Radapon® and other Dow products control weeds and unwanted grasses. They're money-saving and easy to apply. Your own men can do the job, or professional contractors can be called in to do the work. Dow will be pleased to send you, upon request, the name of a qualified distributor nearest you.

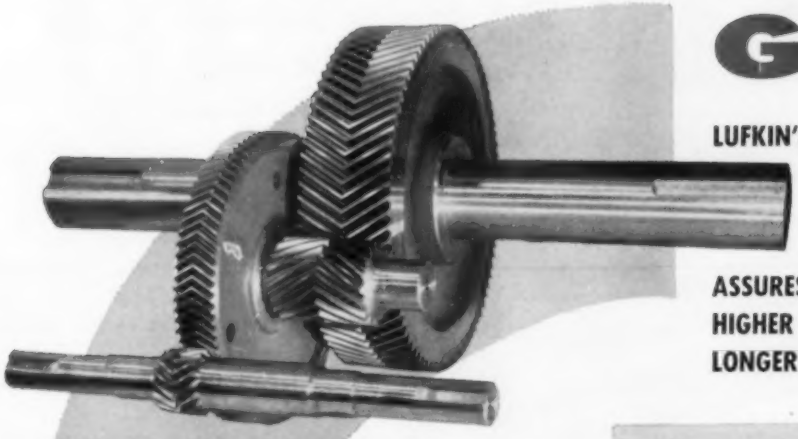
Write today for free literature on industrial vegetation control. THE DOW CHEMICAL COMPANY, Agr. Chemical Sales Dept., Midland, Mich.

YOU CAN DEPEND ON DOW

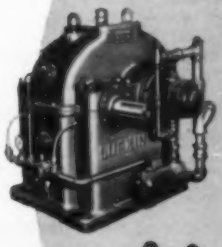
Insure

QUIET, EFFICIENT AND UNINTERRUPTED *Power Transmission*

with LUFKIN *precision* GEARS



LUFKIN'S PRECISION IN DESIGN AND PRODUCTION AS WELL AS THE SELECTION OF FINEST MATERIALS AVAILABLE ASSURES SMOOTH, QUIET OPERATION, HIGHER LOAD CAPACITY, AND LONGER LIFE



SPEED INCREASERS

SPEED REDUCERS

PUMPING UNITS

"precision" means . . .

- CORRECT PROPORTIONS
- ACCURATE TOOTH SPACING
- EXACT HELIX ANGLE
- PERFECT TOOTH CONTOUR
- FINE SURFACE FINISH
- PROPER ALIGNMENT.

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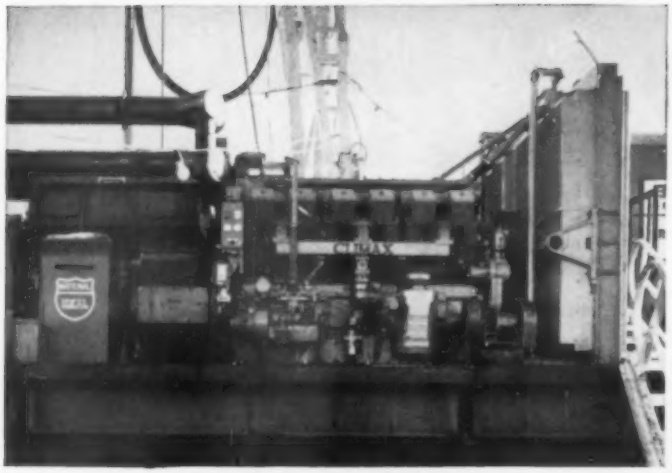
Lufkin equipment in Canada is handled by
THE LUFKIN MACHINE CO., LTD., 9950 65th Avenue, Edmonton, Alberta, Canada, Regina, Saskatchewan, Canada



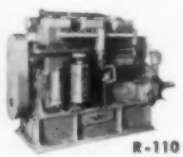
BIGGEST VALUE IN THE ENGINE INDUSTRY

FOR POWERING RIGS

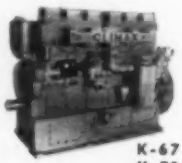
HORSEPOWER RATINGS[1]

Model	No. of Cyls.	Bore and Stroke	Cu. In. Displ.	Pump and Drilling (Continuous Duty)						Hoisting (Intermittent Duty)						
			(2)	600	700	800	900	1000	1100	600	700	800	900	1000	1100	1200
R-110	4	6½x7	824	52	62	71	79	86	91	59	70	80	88	96	103	108
R-165	6	6½x7	1238	81	93	105	117	127	135	91	105	117	131	143	152	160
K-67	6	7x7	1616	110	129	145	161	176	188	124	145	164	181	197	212	225
K-75	6	7½x7	1855	126	146	166	185	204	218	142	166	187	209	230	245	260
V-80	8	7x7	2155	140	165	188	210	230	246	158	185	211	236	258	277	289
V-85	8	7½x7	2474	164	194	223	246	266	284	184	219	250	278	300	318	333
V-122	12	7x7	3232	217	258	293	324	353	378	244	290	330	364	398	426	442
V-125	12	7½x7	3711	242	292	340	384	417	442	272	328	383	432	469	498	520

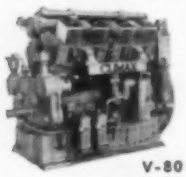
(1) These are continuous duty ratings on standard units that include a radiator and fan.
(2) R.P.M.



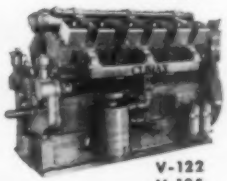
R-110
R-165



K-67
K-75



V-80
V-85



V-122
V-125

Here's Why

1. All models have a 7" stroke.
2. All main and connecting rod bearings are the precision type.
3. All intake and exhaust valves are the free-to-rotate type.
4. All cylinder blocks are provided with renewable sleeves (except R series).
5. All cylinder blocks are cast separate from the crankcase.
6. All pistons are aluminum, cam ground and have five (5) rings.
7. All crankshafts have a main bearing on each side of each crankthrow (except R series).
8. All connecting rods are rifle-drilled for pressure lubrication of piston pins (except R series).
9. All cylinder heads have Climax high turbulence type combustion chambers which produce maximum fuel economy.
10. All crankcases and engine bases have large hand holes on each side for easy access to main and connecting rod bearings and the oil pump.
11. All models have the Climax consistent design that makes possible maximum interchangeability of wearing parts.

These important features mean less down time, easier and faster field servicing and lower maintenance costs.

Ask your nearby Climax Distributor for full details today!

CLIMAX ENGINE MANUFACTURING COMPANY
208 South LaSalle Street • Chicago 4, Illinois
FACTORY—CLINTON, IOWA • DISTRICT OFFICE—DALLAS 1, TEXAS

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GENERAL DIESEL AND EQUIPMENT COMPANY
Williston and Fargo, N. D.

HOUSTON ENGINE AND PUMP CO.
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INDUSTRIAL POWER AND SUPPLY CO.
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GETTING CORRECT RING FIT IS EASY WITH

.... Martin Plungers and the Martin Method of Installation*

The rubber-and-duck rings swell **just so much** and no more.

Rings reach maximum size in the well within a few hours.

Dimensional Compensation during the manufacturing process assures the uniform working fit obtained with Martin Split Rings.

The Martin Ring Size Guide Table* assures proper ring size selection for various gravities, temperatures and sand and water content.

Martin Split Rings are made in steps of .005" in diameter, so that you can actually increase or decrease plunger clearance that amount by changing to next larger or smaller size.

The gaps between the Martin Rings cause fluid turbulence which slows down slippage past the Martin Plunger — just as a rough road slows down your driving speed. Actually, the Martin Plunger maintains pumping efficiency with a looser fit than is possible with a smooth surface plunger.

* See the complete Martin Catalog and instructions in the 1957 Composite Catalog.

JOHN N. MARTIN
Manufacturer
9 W. BRADY • TULSA, OKLA.

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...it identifies all Dresser Companies and their products

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the Dresser Badges of Merit plus+

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CLARK BROS. CO., Olean, New York—Gas turbines, engines, and reciprocating, centrifugal and axial flow compressors—gas, steam, electric and diesel driven.

DRESSER IDECO

DRESSER-IDECO COMPANY, Columbus, Ohio—Radio and television broadcasting towers, steel buildings, aircraft hangars, electric power substations.

DRESSER MANUFACTURING DIVISION

DRESSER MANUFACTURING DIVISION, Bradford, Pa.—Pipe line couplings, pipe repair sleeves and clamps, weldments, forgings, welding fittings, flanges, rings.

GUIBERSON — SAFER THAN SORRY — BETTER BE SAFE

THE GUIBERSON CORPORATION, Dallas, Tex.—Swabs, packers, anchors, workover equipment—drilling heads, blowout preventers, tubing blocks, hooks, swivels, kellys, savers, unions. Gas lift equipment. Molded rubber products.

IDECO®

IDECO, Dallas, Tex.—Hydrair® and Power Rigs; Full-View® Masts; substructures; single, dual and Drive-In Rambler Rigs; blocks, swivels, rotaries; mud pumps; petroleum equipment and supplies.

LANE WELLS

LANE-WELLS CO., Los Angeles, Calif., Houston, Tex., Oklahoma City, Okla.—Electric and Radioactivity Well Logging, Koneshot® perforating and bullet perforating, packers and bridging plugs.

Magcobar.

MAGNET COVE BARIUM CORP., Houston, Tex.—Magcobar® and Magcogel® drilling muds and other specialized oil well drilling fluids and chemicals.

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PACIFIC PUMPS, INC., Huntington Park, Calif.—Centrifugal pumps for refineries, power stations, pipelines, and chemical plants; plunger pumps for oilwells

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ROOTS-CONNERSVILLE BLOWER DIVISION, Connersville, Ind.—Rotary positive blowers, gas pumps, centrifugal blowers, exhausters, vacuum pumps, and positive displacement meters.

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SECURITY ENGINEERING DIVISION, Dallas, Tex., Whittier, Calif.—Rock bits, reamer rock bits and hole openers; reamers, casing scrapers and Neo-Red rubber stabilizers.

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SOUTHWESTERN INDUSTRIAL ELECTRONICS CO., Houston, Tex.—Seismograph systems and instruments—electronic, electro-mechanical. Computers—analog and digital; recording systems. Special transformers, reactors.

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WELL SURVEYS, INC., Tulsa, Okla.—Nuclear and electronic research and development for the petroleum and other industries. Originators of radioactivity logging.

*Trademark registered

put this DRESSER *plus+* team to work for you!

You receive a bonus of extra value whenever you are served by any one of the Dresser companies. *Men with imagination* provide the research, engineering, manufacturing and service applications for the particular specialties of each Dresser operating unit. All Dresser companies work together with their combined experience and facilities to form the world-wide Dresser industrial team. This inter-company teamwork offers a bonus in greater experience and technical knowledge – backed by the extensive Dresser facilities – in the customer's specific industry. This intangible but important factor is known the world over as the Dresser plus+ . . . the mark of superior equipment and services for the oil, gas, chemical, electronic, and general industry.

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AS, CHEMICAL AND ELECTRONIC INDUSTRIES — *EVERYWHERE*

US RUBBER MATCHLESS STEAM HOSE

"U. S. Matchless #5 does 5 different jobs,"

says refinery division superintendent

"It always passes our strictest lab tests."

A mechanical division superintendent of a leading Midwestern refinery says:

"U.S. Matchless Steam Hose always passes our central maintenance department tests, and we've always had good experience with it. The neoprene cover is oil-resistant. The hose is highly flexible and light in weight. Asbestos ply, under the cover, conserves heat. Wire braid preserves static ground."

This great "U.S." hose is serving many industries in many ways. It is obtainable at selected "U.S." distributors, at any of the 28 "U.S." District Sales Offices, or write us at Rockefeller Center, New York 20, N. Y.

Uses in refinery for U.S. Matchless® #5 Hose:

- As a firefighting hose, for safety-checking atop the 235-ft. cracking unit (see picture above).
- In propane tank, to thaw bottom of gauge glass in cold weather (see inset picture above).
- In pump room of cracking unit, as a steaming line to get gas traces out of the unit.
- On propane transfer line, to prevent orifice from freezing in cold weather.
- Enables construction crews to run temporary steam lines more cheaply and quickly than using pipe.

US RUBBER Mechanical Goods Division

United States Rubber

Six choices of corrosion resistant tubes and sockets

4130 alloy steel tube with alloy steel tip and socket.

403 stainless steel tube with alloy steel tip and socket.

403 stainless steel tube with 416 stainless tip and socket.

316 stainless steel tube with alloy steel tip and socket.

316 stainless steel tube with 303 stainless tip and socket.

Monel tube with alloy steel tip and socket.

Tubes and sockets listed above are available in Type 100 Mastergauges which are designed for extreme service and pressures. Type 101 Mastergauges, for medium and high pressures, are available with:

4130 alloy steel tube, with alloy steel tip and socket.

403 stainless steel tube, with 416 stainless steel tip and socket.

403 stainless steel tube with alloy steel tip and socket.

STAINLESS...from socket to tip

Another Marsh development! The superlative Mastergauge is now available with stainless and alloy steel bourdon tubes. Try to find a corrosive service that isn't covered by range of materials listed above.

Tube, socket and tip—every part subjected to a corrosive medium—are fused into one piece by the "Connoweld" process . . . the exclusive process that distinguishes the Marsh Mastergauge from all other gauges.

Whether you need a gauge for corrosive service or any other critical application, Mastergauge is the one correct answer. It gives you the leak-proof Connoweld construction, the stronger, more durable copper-clad Marshalloy case, the precision Mastergauge movement, the "Recalibrator" to preserve its unmatched accuracy. Ask for data covering your specific gauge needs.

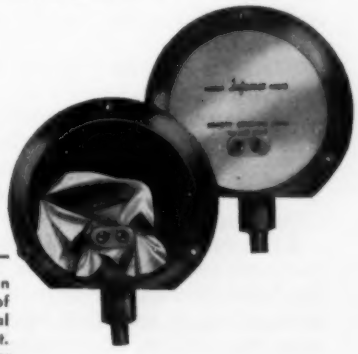
MARSH INSTRUMENT CO. Sales Affiliate of Jas. P. Marsh Corp. **Dept. L, Skokie, Ill.**
Marsh Instrument & Valve Co. (Canada) Ltd. 8407 103rd St., Edmonton, Alberta
Houston Branch Plant: 1121 Rothwell St., Sect. 15, Houston, Texas

MARSH GAUGES

"THE STANDARD OF ACCURACY"

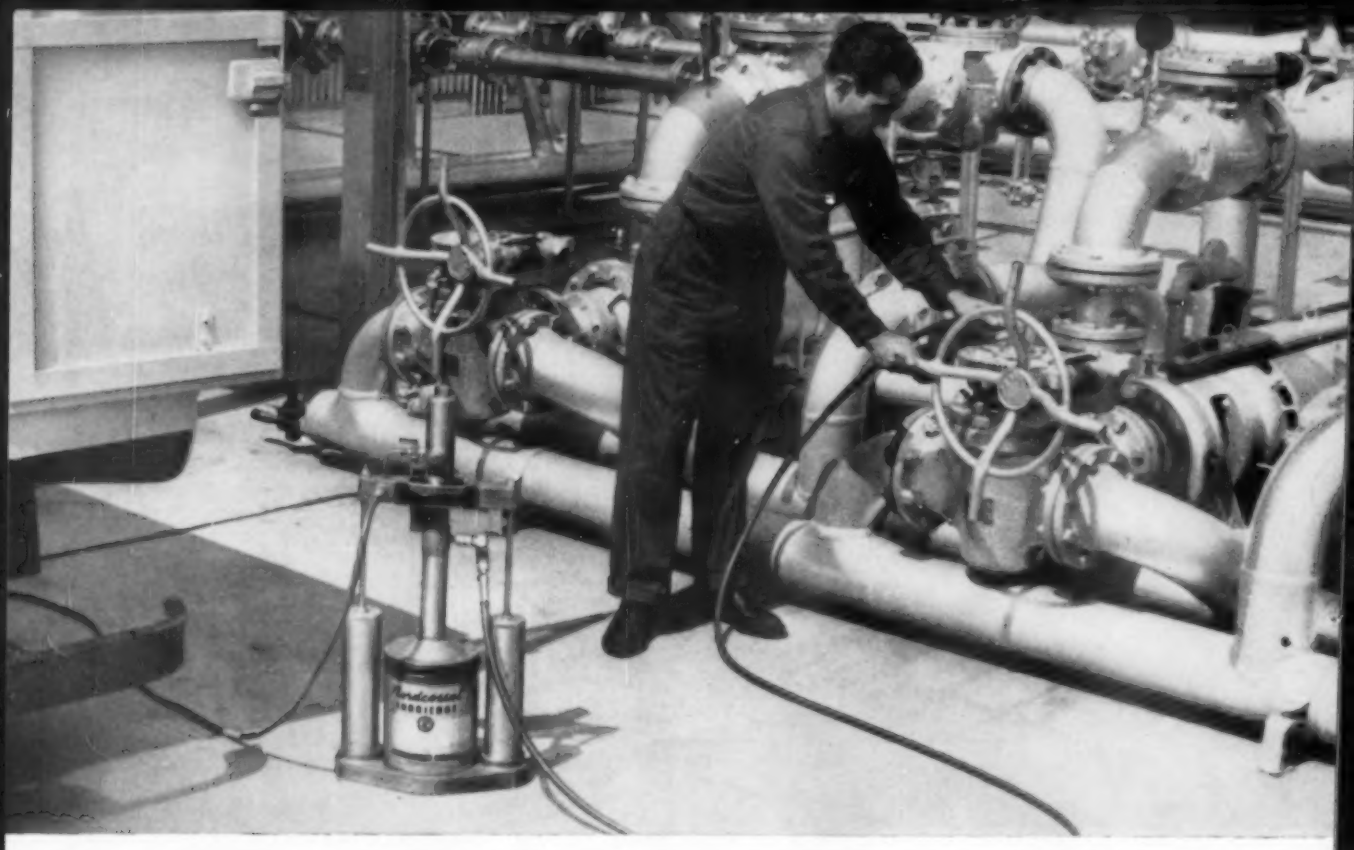
Stainless steel tube in the new SAFECASE

Here is a great combination . . . Marsh Mastergauge with corrosion resistant bourdon tube in the revolutionary Marsh Safecase . . . everything it takes for corrosive service where a surge of overpressure can occur.



Explosive force merely opens safety back—

Photo shows result of laboratory test in which gun cartridge was discharged in rear compartment of Safecase. Thin, tough back yields to abnormal pressure, but cannot be dislodged by blowout. Front of gauge remains intact, protected by heavy metal barrier.



How valve lubrication

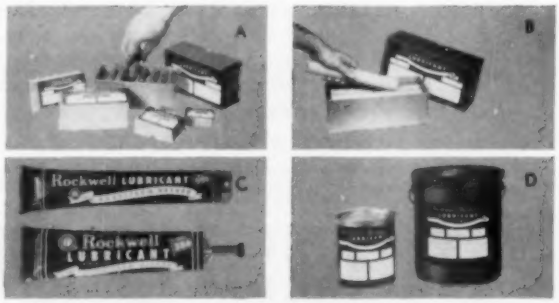
SAVES MONEY

For over forty years, operation cost studies have proved that Rockwell-Nordstrom lubricated plug valves perform better, yet cost far less to use, than ordinary valves. Here's why:

THE FUNCTION OF LUBRICANT is not just to make operation easier, but to form a leakproof, positive seal between the plug and valve body. Pressurized lubricant in the Sealdport grooves is actually a kind of "soft seat" that is instantly replaceable . . . it can't be *permanently* cut, worn or scratched like metal seats. Addition of new lubricant to a Rockwell-Nordstrom valve is like reseating an ordinary valve but it costs pennies instead of dollars.

Lubricant has another *very* important job in a Rockwell-Nordstrom valve. Acting as a "hydraulic" jack the pressurized lubricant provides a means of instantly unseating and freeing the plug . . . even after years in an open or closed position.

In any mechanism with moving parts, lubrication prevents wear and reduces friction. That's why Rockwell-Nordstrom valves work easier, stay in service longer and cost less to use. The information that follows shows equipment that will help you lubricate your valves more efficiently and at lower cost.

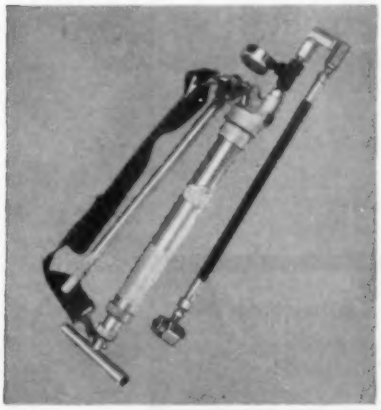


WORLD'S MOST COMPLETE LINE OF LUBRICANTS. Rockwell is the largest and oldest manufacturer of lubricated plug valve lubricants. Each lubricant is a result of painstaking research and careful field testing. A complete list of lubricants and the services for which they are recommended is available . . . use the coupon on the facing page.

The lubricant types illustrated above are (A) Stick Lubricants for manual insertion. (B) Stick Lubricants for lubricant guns, for fast, easy lubrication through the Rockwell fitting on the valves. (C) Gun Tubes for fast refilling of lubricant guns and convenient bulk tubes (spout type) for individual valve lubrication. (D) Bulk Lubricants in five quart and five gallon pails.

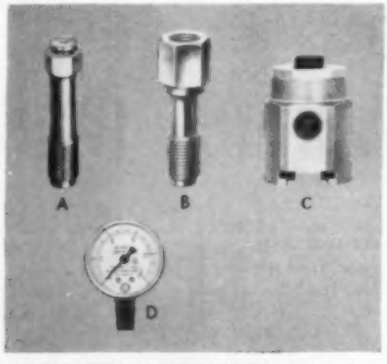
HAND LUBRICATION of a few small valves is done easily by unscrewing the Rockwell fitting with any standard wrench and inserting Rockwell stick lubricant. Screwing down the fitting creates proper lubricant pressure.

ROCKWELL HIGH PRESSURE HYDRAULIC HAND GUN is used at installations similar to those recommended for the booster gun. The Hydraulic Gun develops much higher lubricant pressures with less manual effort making it suitable for lubricating larger valves.



ROCKWELL BOOSTER HAND GUN provides high pressure lubrication for small or medium sized valves at installations where a moderate number of valves are to be maintained. Quickly loaded with stick lubricants, the hand gun is fast, easy to operate and insures proper lubricant pressure within the valve.

ROCKWELL HYPREGUN saves time and labor at large valve installations especially where there are numerous large valves. The Hypregun is a compact, self-priming air operated lubricant bucket gun. Using 5 qt. pails of lubricant, it's easy to properly service the largest valve installations.



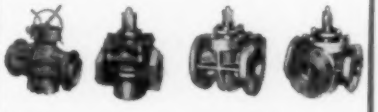
LUBRICATION ACCESSORIES. Just a few of the lubrication accessories available from Rockwell are shown above. The Rockwell Fitting (A) is now standard on all valves. The drilled and tapped lubricant screw (B) makes a convenient fitting for use with pressure gauges or gun fittings. The Rockwell 400 giant button head coupler (C) has a built-in shut-off to eliminate lubricant extrusion from residual pressure in the hose (the "400" is standard on all Rockwell guns and pumps). Pressure gauges (D) for hand guns and bucket pumps tell *automatically* when correct lubricant pressure is reached . . . also indicate when valve needs further gland adjustment.

How to Select Rockwell-Nordstrom Valve Lubricants

Complete details on the proper lubrication of Rockwell-Nordstrom valves and the proper lubricant formula number for a wide range of services are detailed in Rockwell Bulletin V-220. Generally, the following information is vital to the selection of the proper lubricant:

1. Precise description of the line material to be valved.
2. Temperature range to which valve will be subjected.
3. Pressure range within which the valve will work.
4. Size and type of Rockwell-Nordstrom valves.
5. Frequency of operation.
6. Type of lubricant (stick, gun tube, pail or bucket) to be used.

Rockwell's lubricant research staff will be pleased to give special attention to operating problems not specifically covered in the literature.



ROCKWELL-Nordstrom VALVES

it's ROCKWELL MANUFACTURING COMPANY

Rockwell Manufacturing Company
Pittsburgh 8, Pa.

☐ Please send me Rockwell Bulletins V-218 and V-220.

☐ Please have your sales representative call to discuss specific problems.

Name_____

Address_____

City_____ Zone_____ State_____

Vornado alone dared make this test!

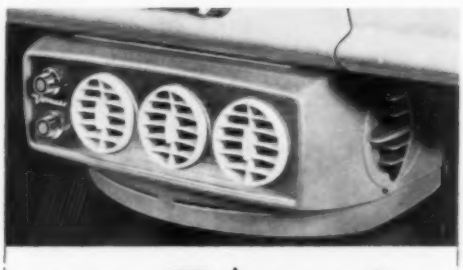
now! PROOF that AUTOMOBILE AIR CONDITIONING makes summer driving safer... healthier!

For thousands of torturous miles in sweltering heat—two matched college athletes drove from Phoenix to Yuma, Arizona, and back... EVERY DAY for 2 weeks! They alternated driving identical cars, one Vornado air conditioned, one not.

Here Are The Results! While driving the Vornado air-conditioned car, each driver felt, ate, and slept better... depth perception improved!

While driving an **identical** non-air conditioned car—each driver lost weight, complained of stomach cramps, experienced HIGHWAY HYPNOSIS, SHOWED A **DANGEROUS** LOSS OF DEPTH PERCEPTION AND SUFFERED EXTREME FATIGUE!

Vornado COOLS BETTER, TOO! The man who "lives in his car" looks better and feels better at the end of his "run." He is in better shape to carry on his work—or enjoy his leisure hours!



ONLY Vornado OFFERS ALL THIS!

- Exclusive curved cooling coil!
- Five air circulators!
- Three-speed blower control!
- Automatic thermostat!
- Giant arctic compressor!
- Install fast! Full factory warranty!
- NATIONWIDE SALES AND SERVICE!

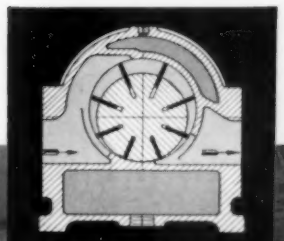
Vornado®
Automobile Air Conditioner

fleet owners! attention!
Contact us today for our special fleet program!

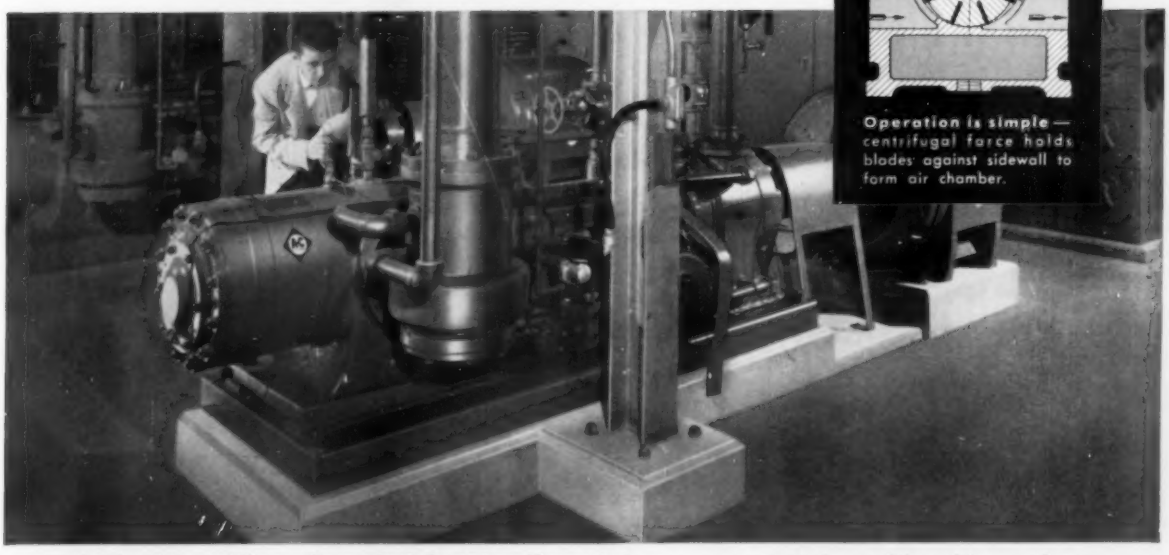
A product of

The O. A. Sutton Corporation, Inc., Wichita, Kansas
World's leading full line manufacturer of comfort cooling appliances

Ro-Flo COMPRESSORS



Operation is simple—centrifugal force holds blades against sidewall to form air chamber.



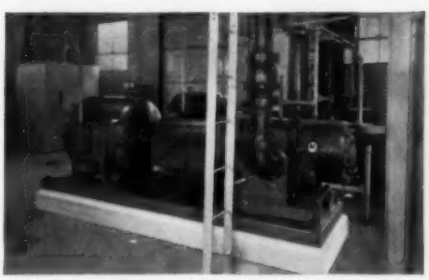
Ro-Flo units at a Midwest utility supply air for mixing with vaporized propane gas to meet an increased demand for natural gas.

No shake...no shimmy...no shock!

Rotary operation produces a remarkably stabilizing effect. You don't get the shimmy and shock inherent in reciprocating compressors.

Users in many industries have discovered that *Ro-Flo* compressors eliminate the cost of heavy foundations. A simple slab is enough. Smaller units are bolted directly to the floor. Automatic wear compensation at the rotor blades keeps compressor efficiency at high level even after years of use. There are only two wearing parts.

Ratings—Choose from twelve sizes of two-stage *Ro-Flo* compressors, ranging from 250 to 1800 cfm at pressures from 60 to 125 pounds gauge. Single-stage *Ro-Flo* units handle pressures up to 50 pounds gauge, and handle volumes from 40 to 3000 cfm.



Two-stage *Ro-Flo* compressor, installed in natural gas pipeline booster station. Unit provides make-up gas to help maintain line pressure for peak loads.

Mobile *Ro-Flo* compressors used on emergency equipment for fighting oil tank fires at a Texas oil storage area.

For complete information on Allis-Chalmers rotary compressors, ask for two-stage Bulletin 16B8244 or single-stage Bulletin 16B8126. Call your nearby A-C office or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wis.

Ro-Flo is an Allis-Chalmers trademark.

ALLIS-CHALMERS

A-5610

STRONGER and SAFER for every high pressure pipeline duty...

...because they are drop forged by Vogt

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Constantly imitated but never duplicated, Vogt drop forged steel fittings and flanges have unmatched strength and toughness for your most severe pipeline duties. Laboratory controlled materials and Vogt's special forging techniques assure products which are always uniform in structure, fine grained, and free from porosity. Thereby the shocks and stresses imposed by high pressures and high temperatures are easily withstood, and with stubborn resistance to erosion and corrosion. Consult Catalog F-9 for our complete line of fittings and flanges.

For a copy of Vogt Catalog F-9 address Dept. 24A-PO

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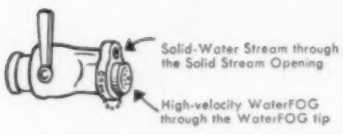
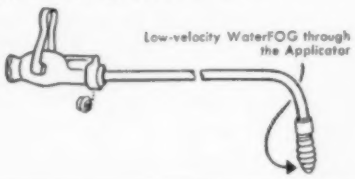
Fittings and Flanges

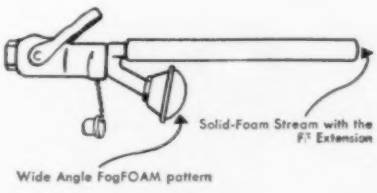
Rockwood SG-60 WaterFOG Nozzle is five nozzles in one

The lightweight Rockwood SG-60 WaterFOG Nozzle *eliminates "special" or single-purpose nozzles!* It actually does the work of five nozzles to put out fires faster, safer and more economically.

Here's what we mean . . .

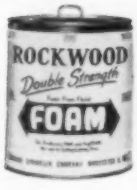






Here's what you need to put out ordinary combustibles and flammable liquids . . .

FOAM and "Wet" Eductor with the new FW Metering-Check Valve. Introduces Rockwood FOAM or "Wet" into hose lines, automatically proportioning correct amount of FOAM and "Wet" to water. Also usable wherever one liquid is fed into another on a fixed percentage basis.

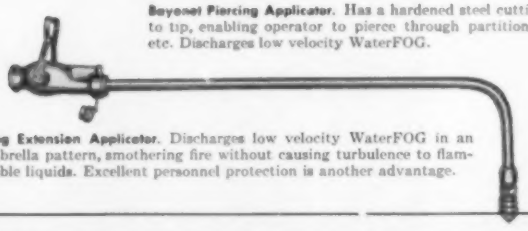


Rockwood Double Strength FOAM. Puts out fires in flammable liquids, and in ordinary combustibles, quicker, at lower cost. Three parts FOAM and 97 parts water create a heat-resistant blanket.

Rockwood WET. One part WET mixed with 99 parts water increases water's penetration and extinguishing action. Gives quickest results against deep seated fires. Saves time, water, manpower.

FF Extension Unit. Shown with Type SG-60 Nozzle. Discharges Rockwood FOAM in a solid stream or as Fog-FOAM. Wide angle makes it possible to cover large areas at one time.

Bayonet Piercing Applicator. Has a hardened steel cutting tool attached to tip, enabling operator to pierce through partitions, into interiors, etc. Discharges low velocity WaterFOG.



Long Extension Applicator. Discharges low velocity WaterFOG in an umbrella pattern, smothering fire without causing turbulence to flammable liquids. Excellent personnel protection is another advantage.

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Distributors in all principal industrial areas

and here's the way to get more information

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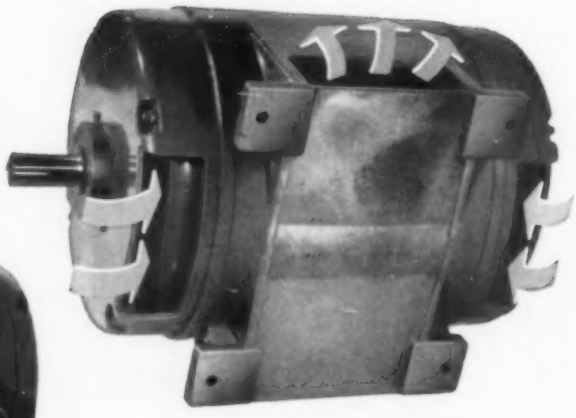
City .....
Zone ..... *State* .....

WAGNER
POLYPHASE
MOTORS

Type DP
1 to 125 hp.



These open type motors give DOUBLE PROTECTION... can be used in many places that formerly required splashproof motors

Wagner Type DP Motors offer the *double protection* of rugged corrosion-resistant cast iron frames and dripproof enclosures so well designed that the DP Motor can handle many applications that formerly required splashproof motors.

These Wagner Motors are built in the new NEMA ratings that pack more power into less space, are lighter in weight and are easier to maintain—only occasional lubrication is required.

SLEEVE BEARING MODELS AVAILABLE

The entire line of ratings through 125 hp. is available with steel-backed, babbitt lined sleeve bearings that have high carrying capacity and provide quieter operation.

Let a Wagner Sales Engineer show you how these motors can be applied to your needs. Call the nearest branch office or write for Wagner Bulletin MU-223.

1 to 125 HP—1750 RPM—40°C NEMA FRAMES 182 through 445U

Wagner Electric Corporation
6389 Plymouth Ave., St. Louis 14, Mo., U.S.A.

WM58-4

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DOUBLY PROTECTED — Wagner DP Motors offer the *double protection* of completely dripproof enclosures and rugged cast iron frames that can take rough handling and resist corrosion.

CAN BE RELUBRICATED — These motors can be re-greased when desired for longer bearing life. Fresh grease can be added—old grease removed—through openings provided in the ball bearing housing.

COOL RUNNING — Specially designed baffles direct cooling air through the motor to protect the stator windings. Blowers, cast as part of the rotor, move large volumes of air without noise or vibration.

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Values

R-P&C VALVES

THE COMPLETE LINE
—DESIGNED FOR DEPENDABILITY

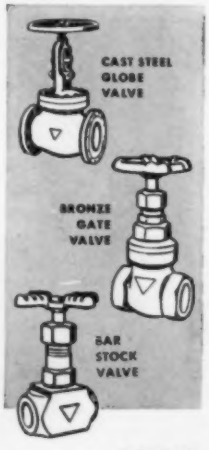
Created by R-P&C—made and sold exclusively by R-P&C...Electric Furnace Iron Valves

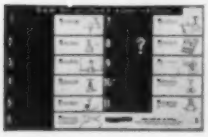
Electric furnace iron—introduced exclusively in R-P&C Valves—provides a high quality cast iron that meets the exacting requirements for pressure castings. Melted and refined under closest metallurgical supervision, R-P&C Electric Iron has physical properties *far exceeding the minimum standards* to which they must conform. It has a balanced chemical composition and a tough, dense body structure; and, it is more resistant to corrosion. All cast iron parts of R-P&C Valves are made of this Electric Furnace Iron.

Shown above is **Fig. 625**, a general service valve which is particularly applicable where full, unobstructed flow is desired. This type, available in bronze-trimmed or all-iron style, either flanged or screwed, is made in fifteen sizes, from 2″ to 24″—and is typical of the better values offered by the entire line of R-P&C Electric Iron Valves.

The R-P&C Line is Complete

The R-P&C line embraces gate, globe, angle and check valves in bronze, electric furnace iron and cast steel, and forged steel; all in a wide range of sizes, styles and pressure classes. Also, R-P&C offers specialties such as Lubrotite gate valves, bar stock valves, asbestos-packed cocks, cast steel fittings and pressure-seal cast steel valves. Order through your nearby R-P&C Distributor. For complete catalog, write our Reading office.





FREE WALL CHART
"How to Protect Your Valves"
Installation pointers, operating tips, clues to longer valve life. They are all on this 22″ x 17″ wall chart. Write for your free copy.

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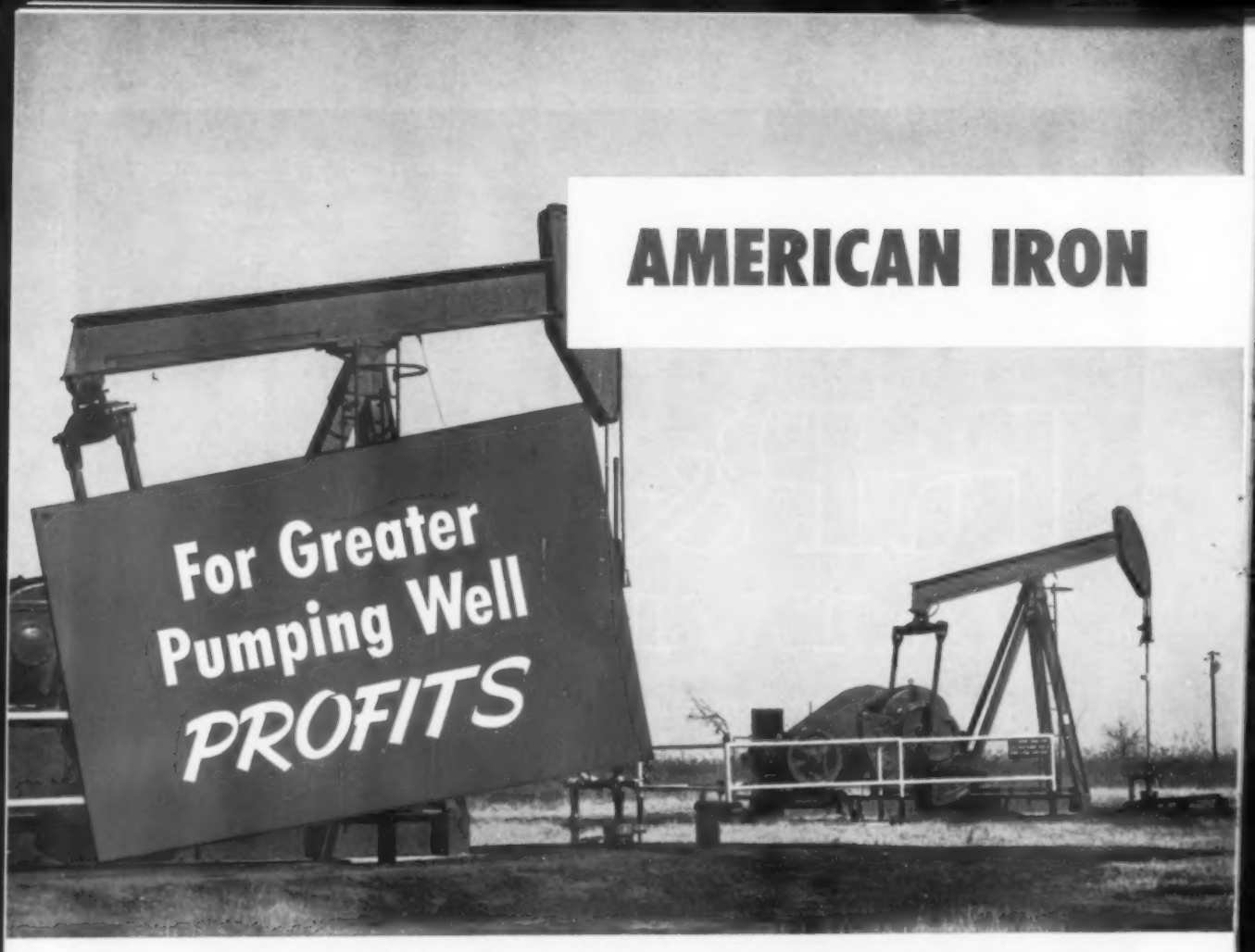


Your Pumping Wells Become More Profitable when you install the AMERICAN IRON *NEW* TENSION TUBING ANCHOR

Completely Retrievable Under All Conditions:

Under normal conditions, just re-jay and pull. Tubing anchor will retrieve easily. Under adverse conditions, a steady upward pull on the tubing will cause a tensile failure of the relief groove in the slip mandrel extension. The upper portion of the slip mandrel extension then becomes a jar that strikes the inside shoulder at the upper end of the housing. The slips are pulled away from the cone and the tool can be retrieved.

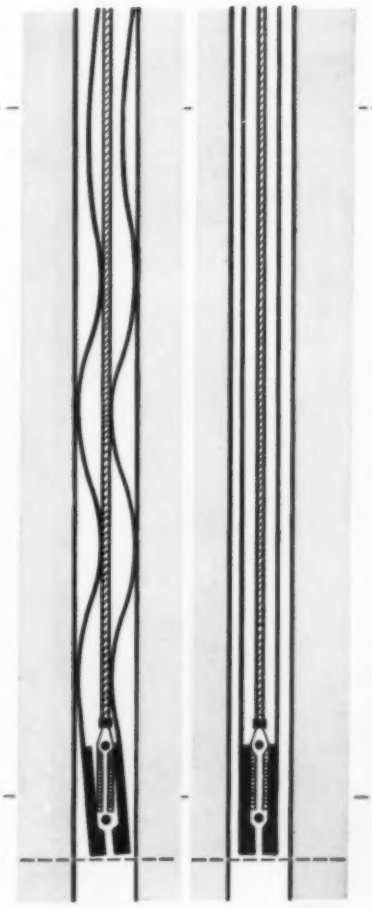
MONEY-SAVING ADVANTAGES listed below show how the American Iron new tubing anchor helps you get maximum pumping well profits!

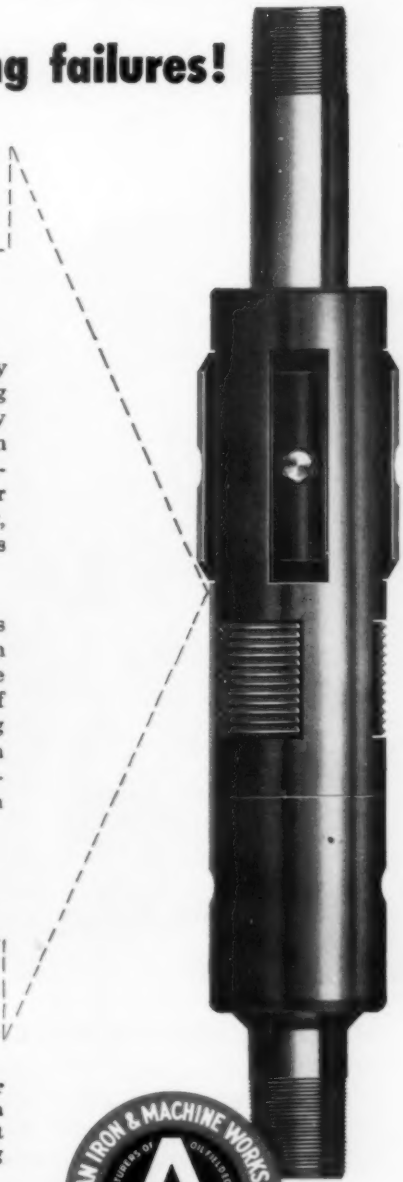
- **Increases service-life of rods and tubing!**
- **Increases fatigue-life of tubing!**
- **Increases efficiency of the pump!**
- **Decreases tubing connection wear!**
- **Decreases rod-on-tubing wear!**
- **Decreases horsepower input requirements!**
- **May be used as Automatic Tension Tubing Anchor, Positive Tension Tubing Anchor!**

35 YEARS' EXPERIENCE ENABLES AMERICAN IRON & MACHINE WORKS CO.

NEW TENSION TUBING ANCHOR

prevents costly sucker rod and tubing failures!





IN PUMPING WELLS, the costly buckling, breathing and cork-screwing of tubing can now be prevented by keeping pumping strings in tension with the American Iron Tension Tubing Anchor. Once this tubing anchor is set, all movement of the tubing, either upward or downward, is eliminated!

FREELY SUSPENDED TUBING buckles on the upstroke . . . and straightens on the downstroke. This damaging cycle can now be prevented by the use of the new American Iron Tension Tubing Anchor—created through American Iron research and design . . . and manufactured under American Iron high quality control standards.

(left)—FREELY SUSPENDED TUBING buckles on the upstroke and *(right)* straightens on the down stroke.

Get all the details now—from your Supply Store or your American Iron representative . . . get the facts that will lead you to greater pumping well profits!

Contact your Supply Store now!

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50 Million Dollar Four Corners Pipeline

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Long-lasting protection on over 573 miles of 16" pipe

For low-cost, long term protection against corrosive action on this valuable pipeline, Four Corners is using Blue Flag Pipe Wrap. Blue Flag provides extra years of maximum protection—for less than ½ of 1% of initial cost. It greatly increases enamel strength . . . gives top resistance to cracking . . . helps protect from backfill damage. Blue Flag is "made-to-order" for high speed machine application over the roughest terrain. Contractors have less down-time—fewer "holidays"—with Blue Flag.

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The hottest "onshore" oil producing territory in the country today is the Four Corners area of Utah, Colorado, New Mexico and Arizona. This prolific area is being tapped by a mammoth pipeline extending all the way to Los Angeles. Owned by six major oil companies, Four Corners Pipeline will mutually benefit oil producers in the field and the oil purchasing companies in Southern California.

For technical data on applications such as this Four Corners job, write L·O·F Glass Fibers Company, Toledo, Ohio. Dept. 78-28.

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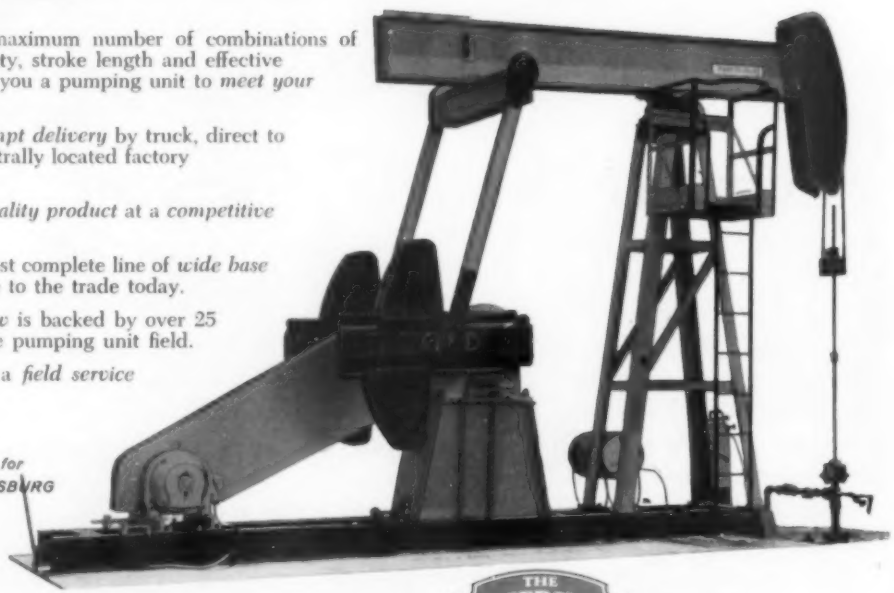
1. Parkersburg offers a maximum number of combinations of gears, structural capacity, stroke length and effective counterbalance to give you a pumping unit to *meet your specific requirement.*
2. Parkersburg *offers prompt delivery* by truck, direct to your lease, from its centrally located factory at Coffeyville, Kansas.
3. Parkersburg offers a *quality product* at a *competitive price.*
4. Parkersburg has the most complete line of *wide base portable units* available to the trade today.
5. Parkersburg's *know-how* is backed by over 25 years' experience in the pumping unit field.
6. Parkersburg maintains a *field service* surpassed by none.

For economy, for performance, for dependability, specify PARKERSBURG geared pumping units.



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DIVISION OF PARKERSBURG-ÆTNA CORPORATION

THE PARKERSBURG RIG AND REEL CO. PARKERSBURG WEST VIRGINIA MADE IN U.S.A.

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to cooling: a solution

By trunk or by tower, evaporative cooling has proved its practicability. Contributing to the effectiveness of this method of industrial cooling is the Peerless vertical industrial service pump. Efficient, versatile and economical, the Peerless vertical pump offers optimum performance in all ranges, plus these *extra value* Peerless features: *unitized pump-motor manufacture*, for perfect alignment, increased pump durability; *improved suction manifolding* for better water intake, less friction; *advanced vertical turbine design* for highest efficiency, maximum performance; *designed-in flexibility* of a modern pump, for easy adaptation for future system requirements.

PEERLESS PUMPS

WRITE FOR ILLUSTRATED BULLETIN NO. B-505

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REPUBLIC Alloy Steel safeguards deep drilling operations 4 Miles Down

REPUBLIC ALLOY STEELS are particularly important in today's deep drilling operations. Exceptionally high strength-to-weight ratio produces equipment with extra strength, toughness, and dependability without added weight or bulk. Here, tool joints made by Lansdowne Steel & Iron Company are ready for shipment to the field. Write for additional information today.

Ask any experienced "roughneck". He'll tell you that you can't stress tool joint quality too much when you are deep-well drilling at 20,000 feet. Fishing for a lost string 4 miles down is costly in time, materials, and manpower.

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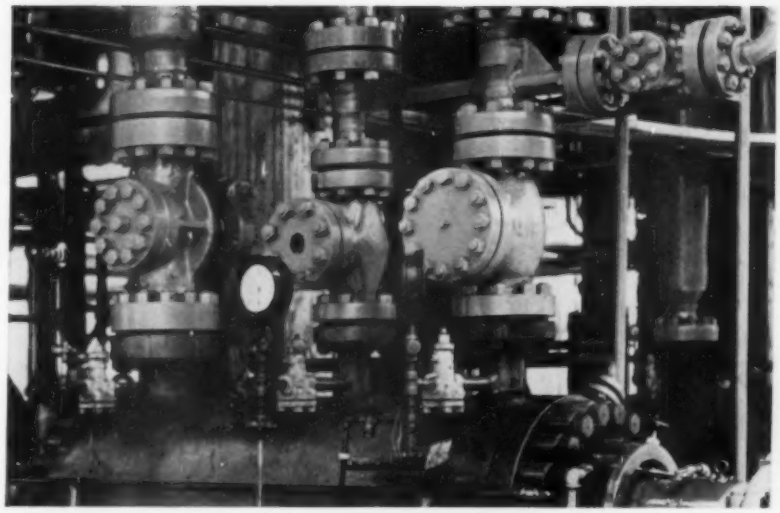
Republic Alloy Steel billets, 4½- to 5-inches square, are sheared into 14-inch lengths on a hydraulic breaking machine. After breaking, the square billets are heated, then forged into a rough shape, pressed round and pierced, rough machined, and finished.

But, why Republic Alloy Steel? Because every Republic heat is scientifically controlled from ore to mill through Republic's modern and efficient integrated steel producing facilities. This careful control results in finished alloy steel which enables manufacturers to produce better oil country equipment.

Making better tool joints is a typical example of the many ways Republic Alloy Steels serve the petroleum industry. Write today, let Republic metallurgists help you, too, solve your manufacturing problems.

REPUBLIC ALLOY STEEL STUDS safeguard men and equipment and reduce replacement costs, too. Get such safety and savings by specifying Republic Alloy Studs on shut-off valves, headers, pressure vessels, and on high-pressure, high-temperature refinery equipment. Tough threads and high tensile strength combine to provide maximum holding power and resistance to wear. They tighten smoothly, yet back-off easily for equipment maintenance. Want to learn more about Republic Alloy Studs? Send coupon today for complete facts.



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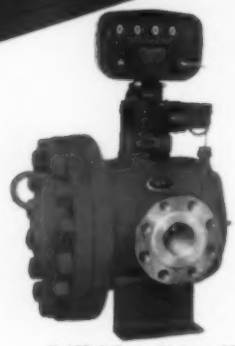
Record NET metered gallonage—

Brodie Automatic Temperature Compensator, shown with Brodimatic Printing Counter, automatically corrects reading to net 60 F volume during run.

BRODIE AUTOMATIC TEMPERATURE COMPENSATOR with full range GRAVITY SELECTOR

- Automatically corrects counter reading to net volume which liquid would measure at 60 F
- Compensates for changes in both line fluid and ambient temperature effects over wide range
- Easily adjusted to precise expansion coefficient of any petroleum product or crude
- Available with single net counter, or dual counter to provide both net and gross readings
- May be used with Brodie Accumulator System to record total thruput of two or more Brodie Meters in series
- For pipelines, loading racks, blending, LACT systems, and refineries



B-65D *BiRotor* Meter with Automatic Temperature Compensator and Gravity Selector, Brodimatic Counter.

Corrected net gallonage figures can be taken directly from the counter readout or printed ticket — further extending the advantages of the sustained accuracy of Brodie *BiRotor* Meters. The Brodie Automatic Temperature Compensator with Gravity Selector is now thoroughly proved through a wide range of field applications. For the complete story, see your nearest Brodie Metering Specialist, or write today for Bulletin No. 652.

802-R

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ALL-STEEL TRUE ROTARY

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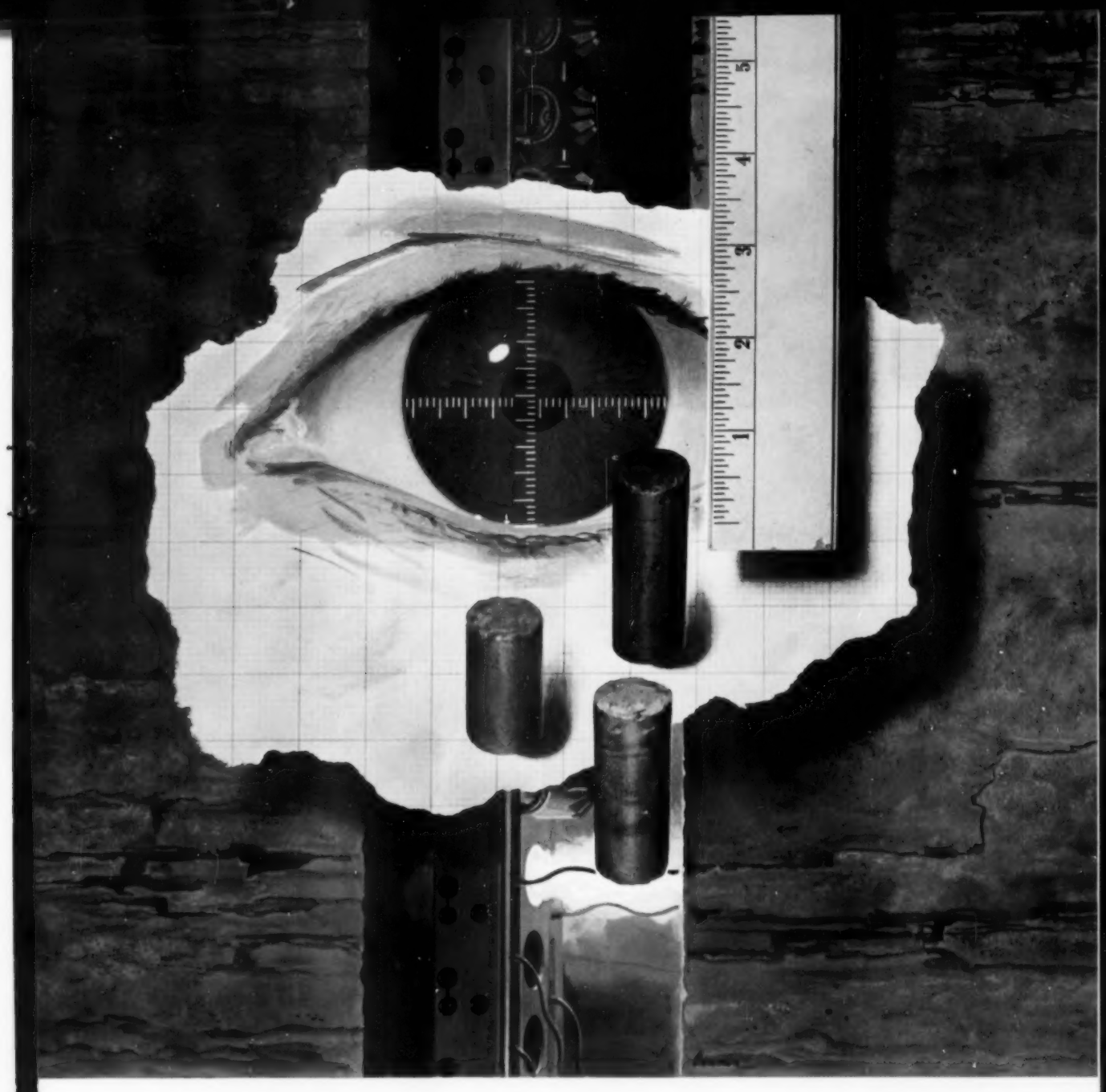
REPRESENTATIVES WITH STOCKS AND SERVICE FACILITIES IN ALL PRINCIPAL CITIES



It "threads the needle" at any depth

In hard or soft formations, successful side-wall coring operations can be performed with the Schlumberger Side-Wall Coring Instrument. Up to 30 cores (large enough for a complete core analysis) can be obtained on one trip in the hole.

Pin-point accuracy is assured since cores are obtained at exactly the desired depth by using the S.P. Curve as a direct reference.

The Schlumberger Side-Wall Coring Instrument is simple, it's safe, it's proved by thousands of runs to be fast and dependable. Also to your advantage, a Schlumberger coring operation costs much less than conventional, wire line or diamond cores taken at the same depths.

Ask your Schlumberger representative to advise you how Schlumberger Side-Wall Cores can help reduce costs, and give a better, faster look at production possibilities.

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For Weather . . .
or Explosive Atmospheres

. . . specify
ALLEN-BRADLEY

Regular "inspection" or maintenance becomes an important "expense" item when the nature of the installation requires a bolted cover, as used with watertight or explosion-proof enclosures. Valuable time is lost in opening the enclosure—and the same time is again lost when bolting down the cover.

You can save the major portion of this expense by using Allen-Bradley starters. Their solenoid design . . . with only *one* moving part . . . is good for millions of trouble free operations. Routine inspection is unnecessary. The double break, silver alloy contacts are *always* in perfect operating condition. The overload relays are unaffected by time or atmospheric conditions. In plain English . . . you can install A-B starters . . . and forget them.

Better specify "Allen-Bradley" for all of your control requirements—you cannot go wrong!

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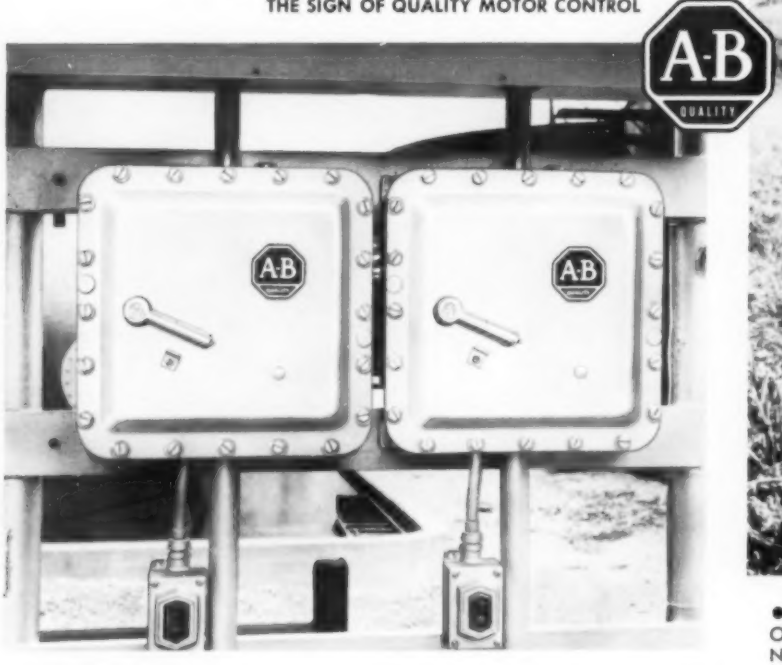
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

THE SIGN OF QUALITY MOTOR CONTROL



● Charging pumps for crude oil still in Ponca City, Oklahoma, equipped with Allen-Bradley motor controls with NEMA Type 7 explosion-proof enclosure.

● Pipeline gathering pump in Jenks, Oklahoma, with Allen-Bradley starter in a NEMA Type 3 weather-resistant enclosure.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

BJ's exclusive coil-flex fingers assure you a better scratching job every time!

Look at the way the coil-spring-enclosed scratching fingers always bounce back to their original shape and position. The same thing happens when your BJ Red Top Scratcher is down hole. You get a better scratching job with fewer strokes because, unlike with an ordinary straight-wire scratcher, the Red Top's fingers never get kinked or bent out of shape—neither during installation nor in use—but stay at peak efficiency throughout their use.

Only the BJ Red Top scratcher has double-spring construction throughout. Each finger has a cluster of straight wires—for better scratching—encased in a tight coiled spring—for positive bounce-back.

Byron Jackson Scratchers are manufactured in sizes to fit all API casing OD's from 4½" to 13⅜". Every model features a sturdy hinged clamp-around design.

Specify BJ Red Tops next time and assure yourself better scratching and better cementing. They're sold through recognized supply stores and stocked in all BJ warehouses.

Byron Jackson Tools, Inc.

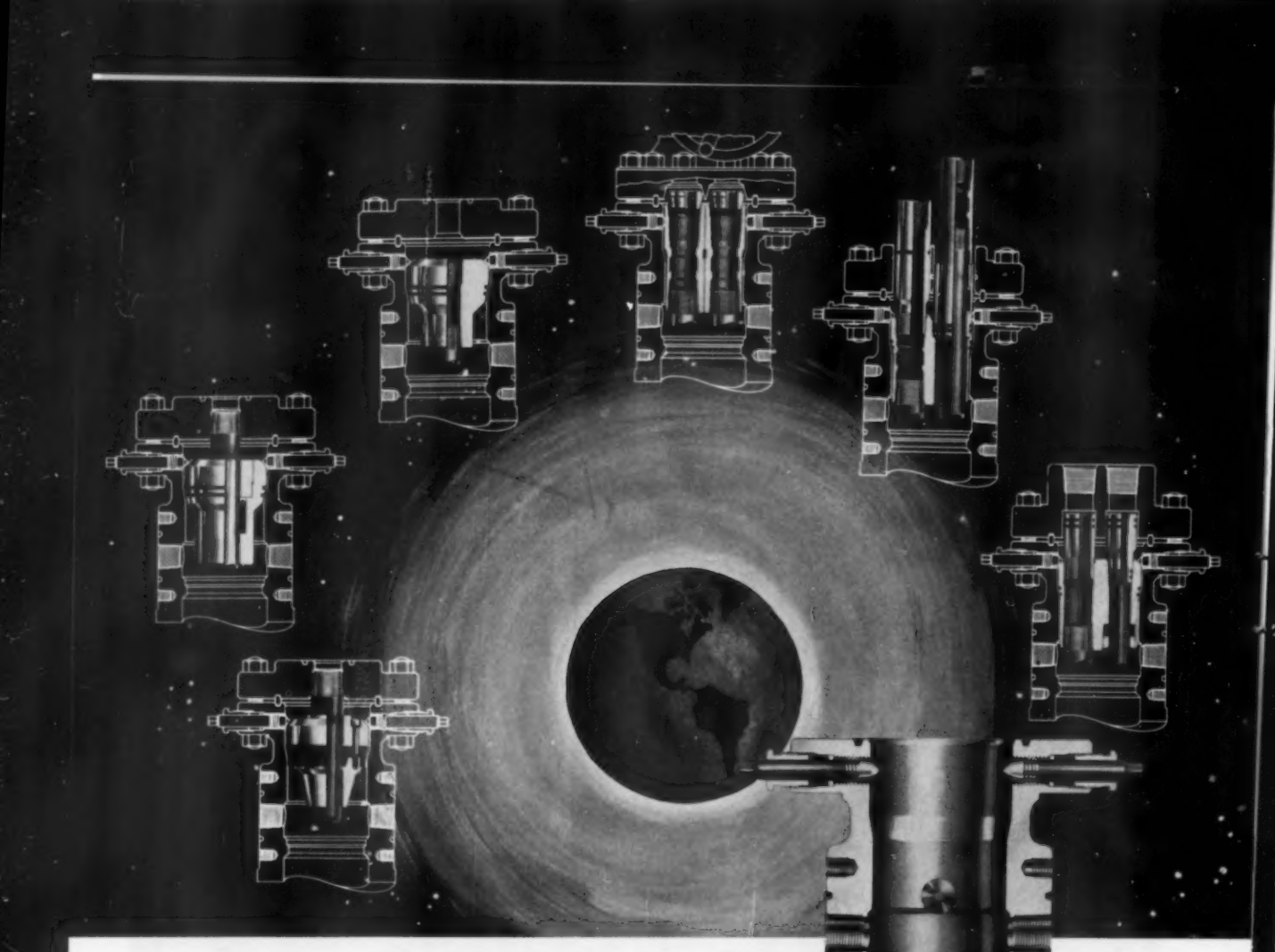
A SUBSIDIARY OF BORG-WARNER CORPORATION

P.O. Box 2017A, Terminal Annex, Los Angeles 54, California • Cable: "BJTOOL"
Export Address: 580 Fifth Avenue, Suite 510, New York 36, New York

WATCH BJ FOR THE NEWEST

The spring's the thing with BJ Red Top Centralizers too.

Write for literature that describes their unique design and operation.



O·C·T HAS MADE NEWS!

. . . the FIRST Universal Tubing Head for DUAL STRING or SINGLE STRING completions . . .

Now, for the first time, it is possible to install a tubing head which has a complete line of interchangeable dual string and single string tubing hangers.

The O-C-T Universal Tubing Head is versatile . . . because an operator may singly or dually complete a well at will with complete control throughout the operation.

The complete range of interchangeable tubing hangers possible with this revolutionary tool means that any last minute change in complete procedures (from single to dual or vice versa) can be made without changing tubing heads or using special attachments.

In short this is the answer to an industry demand—

● Control at all times ● Versatility ● Ease of installation ● Economy ● Wide range (600 through 2900 series, flange sizes from 6" to 10")

We will be glad to send complete information on request.

where progress is a daily practice.....

O·C·T

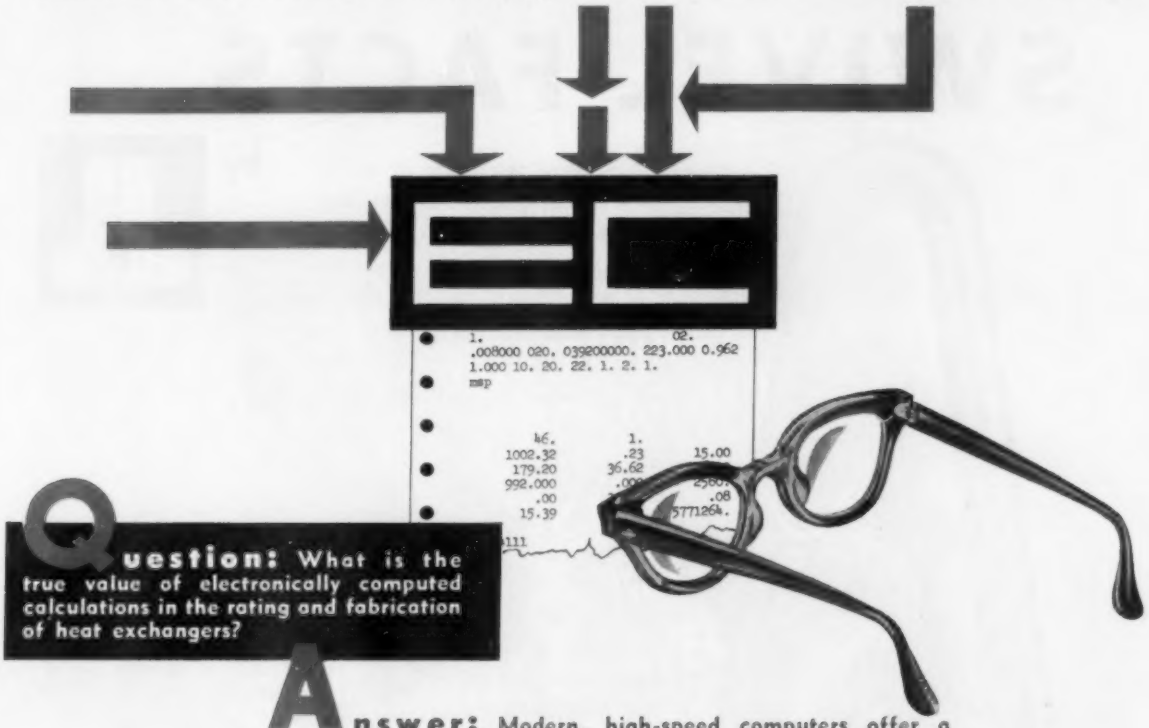
OIL CENTER TOOL CO.

SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

This "UA" attachment adapts conventional A.P.I. Tubing Heads so they may be used with any dual string and single string "U" Hangers. A saving can be realized because the attachments cost less than the Universal Tubing Head.

Export Representatives: South America — East West Oiltools, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

What about Electronic Computers in heat exchanger ratings?



Question: What is the true value of electronically computed calculations in the rating and fabrication of heat exchangers?

Answer: Modern, high-speed computers offer a high degree of accuracy, and enable a fabricator to carry a high volume of design ratings, HOWEVER . . .

. . . AT WESTERN, we recognize that, accurate as our electronically computed data is, the *effectiveness* of Western heat exchanger ratings depends on the *interpretations* our rating engineers put on the data. Thus personal scrutiny, years of experience with our customers and intimate knowledge of customer preference — all work together to produce the equipment you require *for your specific need.*

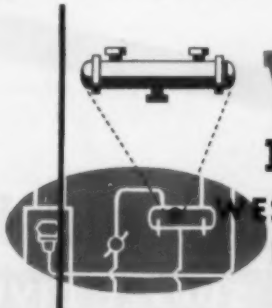
In the utilization of electronically computed data, a prescribed course is followed and should be thoroughly understood by both fabricator and customer.

First, the thermal and mechanical information is given by the customer. Second, preliminary calculations are made to set up the average physical and chemical properties of the fluids involved.

Third, the thermal and mechanical data is fed into the high-speed computer which is programmed to follow the step-by-step exchanger calculation procedures. Fourth, the electronic computer prints out the calculated answer to the problem.

Fifth — and MOST IMPORTANT AT WESTERN — each resulting rating is carefully scrutinized by our engineers in view of their extensive experience in the heat exchanger industry, as well as their background in customer preference. For years, Western has recognized that the true value of our electronic computer depends not only on the accuracy of the original data, but upon the precise and pertinent interpretations of the ultimate ratings by Western engineers, in light of each customer's specific application.

Proper utilization of the most modern methods is augmented by attention to detail and close personal relationship between Western and every customer, regardless of his requirements.



WESTERN
HEAT EXCHANGERS
WESTERN SUPPLY COMPANY
P.O. Box 1888 – Tulsa, Oklahoma

SWIVEL FACTS

by

The floating washpipe in an IDECO swivel can be repacked by one man in about 22 minutes, using a sealed packing assembly stocked by your near-by J&L Supply store. Your IDECO swivel is then normally ready for many more wells before washpipe or packing needs further attention.

Everything about an IDECO swivel is just as simple and durable.

You can have straight or tapered main roller bearings. The swivel is available in five sizes, with dead load capacities to 500 tons. The 500-ton job has four separate bearings. An IDECO cannot be distorted by bail loading.

From Canada to the Gulf of Mexico more IDECO swivels go to work annually, and with good reason. Drillers like them and the good word gets around.

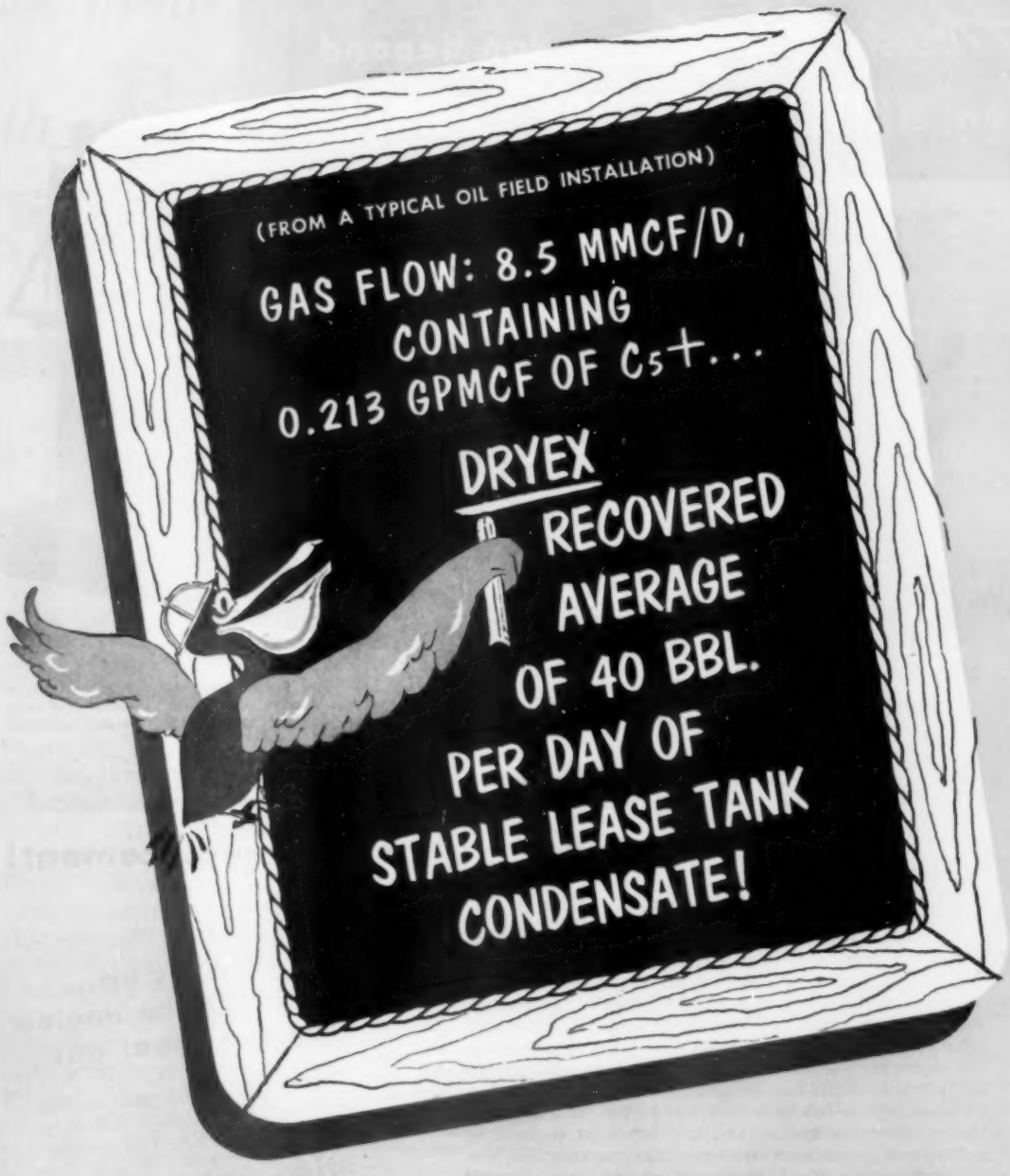
Have the details on file when you need a new swivel — call your J&L Supply store now!

Jones & Laughlin

SUPPLY DIVISION – Tulsa

J&L – A GREAT NAME IN SUPPLIES

15M


(FROM A TYPICAL OIL FIELD INSTALLATION)
GAS FLOW: 8.5 MMCF/D, CONTAINING 0.213 GPMCF OF C_5+...
DRYEX RECOVERED AVERAGE OF 40 BBL. PER DAY OF STABLE LEASE TANK CONDENSATE!

Dryex is the latest in a complete line of oil field equipment manufactured by Delta Tank. For complete information on costs, performances, etc. . . . . .

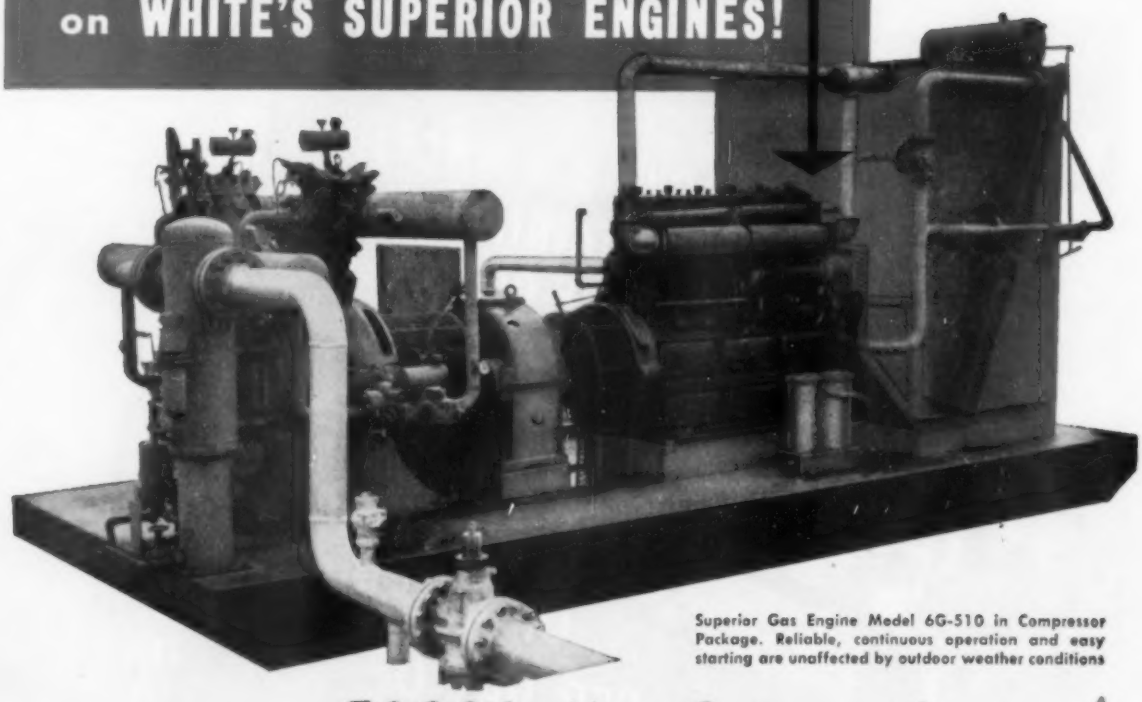
Ask the Delta man

DELTA TANK MANUFACTURING COMPANY, INC.
BATON ROUGE, LOUISIANA

PLANTS: BATON ROUGE, LA. • MACON, GA. • BEARDSTOWN, ILL.
EXPORT OFFICE: INTERNATIONAL TRADE MART, NEW ORLEANS, LOUISIANA
SALES OFFICES: NEW YORK, N. Y.; WESTWEGO, LA.; LAFAYETTE, LA.; BOSSIER CITY, LA., LAUREL, MISS.; HOUSTON, TEXAS.

ENGINEERS: Desirable positions available at Delta Tank for engineers and skilled mechanics in many categories. Address inquiries to Employment Manager.

Here's Proof...you can depend on WHITE'S SUPERIOR ENGINES!



Superior Gas Engine Model 6G-510 in Compressor Package. Reliable, continuous operation and easy starting are unaffected by outdoor weather conditions

more than *50,000 Hours Continuous Operation!*

no major overhaul or part replacement!

Service records show Superior's first major repair usually comes due long after other engines would be completely replaced . . . over 50,000 hours continuous operation has been reported with no major overhaul or major part replacement required. White's extreme design simplicity makes this possible. High mortality parts are eliminated, thus prolonging engine life and reducing repairs and maintenance. Relatively few cylinders and internal parts supply power equal to other engines having more cylinders and more complex design. Precision construction and advanced engineering refinements reduce wear on all parts and guarantee low lube oil consumption. Highly developed, rugged, open chamber combustion system assures maximum fuel economy and also exclusive operation on non-premium fuels. Cost-per-horsepower operation is much lower than comparable models in the same power range. Conservative horsepower ratings allow plenty of reserve to meet extreme operating conditions.

It all adds up... Superior is the engine you can count on!

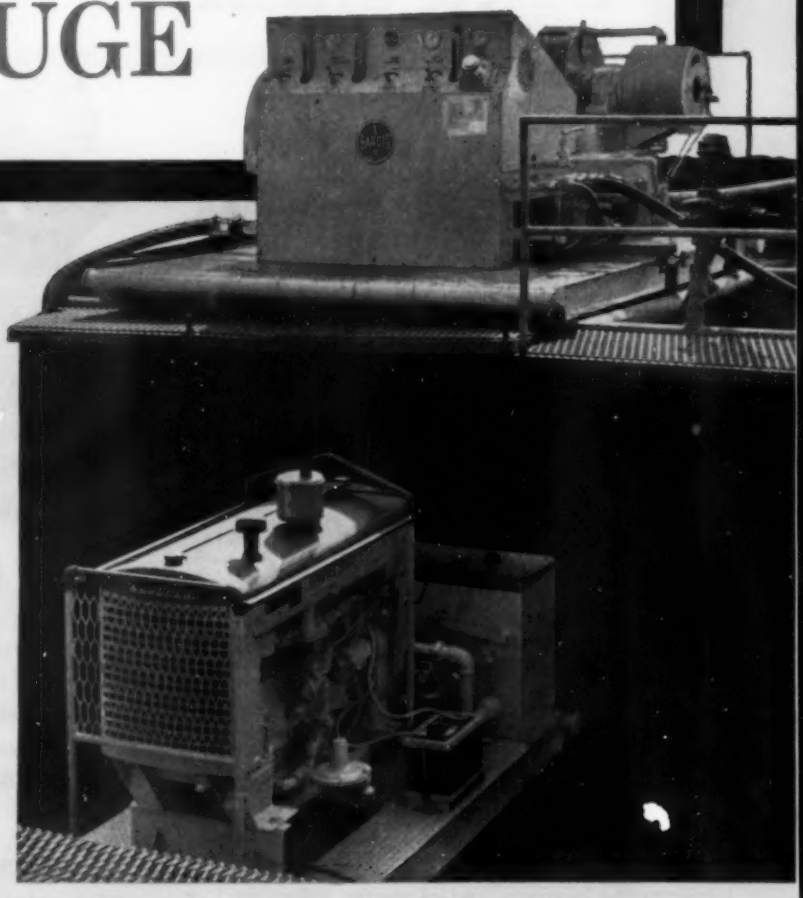
Diesel, dual-fuel or gas engines range from 190 to 2150 H.P. Portable or stationary generator sets range from 150 to 1500 KW. For pipe line pumping, gas compressor drive and power generation, specify modern, compact, powerful Superior engines . . . field-proven in hundreds of oil field applications! Write today for additional information!

Superior ENGINES · ATLAS Imperial DIESEL ENGINES · White DIESEL

White Diesel

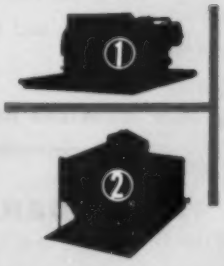
WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY
Plant and General Offices: Springfield, Ohio

Save money . . . control mud properties with BAROID CENTRIFUGE



Baroid's Mud Centrifuge spins out undesirable solids that may have adverse effects upon mud properties. Mud Centrifuge treatment aids in control of mud weight, viscosity, gel strength, filtration rate, and cake thickness.

Baroid's Mud Centrifuge rejects sand, contaminants, spent chemicals, and up to 50% of trouble-causing clays. This eliminates the jetting away of valuable mud and reduces the demand for chemical thinners. Baroid's Mud Centrifuge returns the useful mud weight to your mud tank for immediate re-use. Baroid is the *only* mud company to make a real attempt toward reducing mud costs by offering a really efficient centrifuge. On many jobs Baroid's Mud Centrifuge will pay its cost, with the weighting material conserved, in as little as two hours operation per day. Available on short or long term lease basis. For details call your local Baroid representative.



Simple and trouble-free, Baroid's Mud Centrifuge consists of (1) the skid mounted centrifuge, and a portable mud pump that is immersed in the mud pit, (2) a skid mounted engine (diesel, gasoline, natural gas, butane, or steam turbine) driving a hydraulic pump furnishing power to unit above. It requires no electrical equipment. Has built-in safety features preventing damage to equipment by loss of coolant or overloading.

BAROID

BAROID DIVISION • NATIONAL LEAD CO.
Main Office: P. O. Box 1675, Houston 1, Texas

BAROID DIVISION • NATIONAL LEAD CO.
P. O. Box 1675, Houston 1, Texas

Please send me your Centrifuge Bulletin.

Name_____ Title_____

Company_____

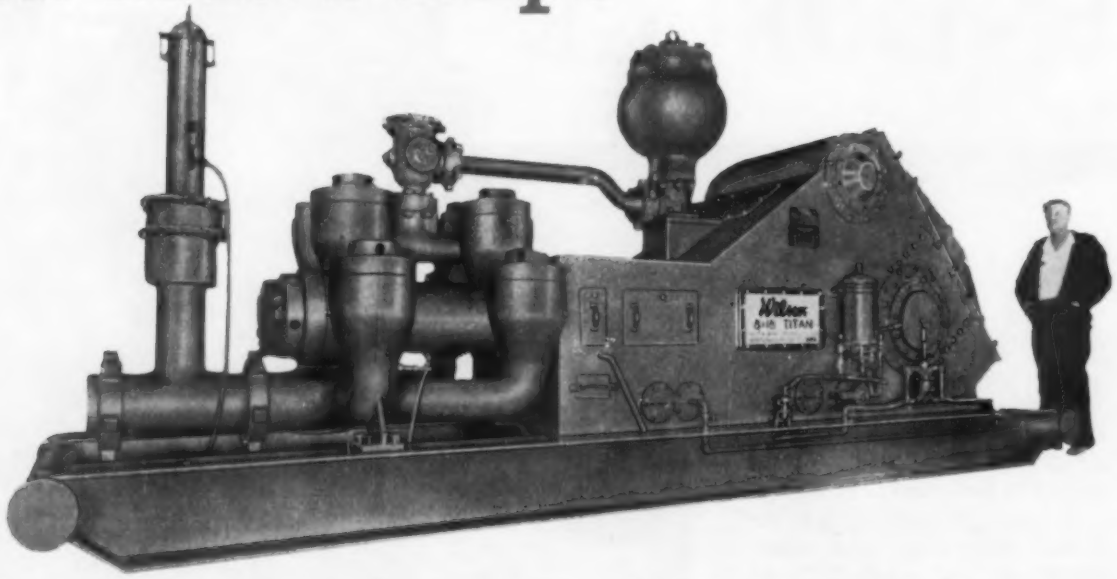
Address_____

City_____ Zone_____

B 5813

A Statement to Drilling Contractors...

Chain Drive vs. Gear Drive on Mud Pumps



When Gears run together under load as in a mud pump drive, a *sliding action takes place between the teeth that might be called a "scouring action."* Under heavy load this tends to rub small flakes of metal off the teeth, particularly if there is even the slightest bit of sand or grit in the lubricant. When these metal flakes get in the oil they are carried back again into the gear teeth where they intensify the wearing process, until it is not long before the gears are completely worn out. And in some pumps this same oil is used to lubricate the bearings, and of course either sand or metal flakes are highly destructive to either plain or anti-friction bearings.

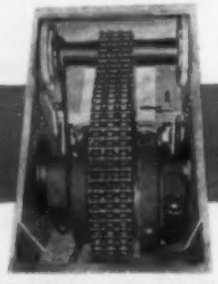
In the Wilson Chain Drive Mud Pump no sliding action, *only a rolling action takes place between the sprockets and the chain.*

In the Wilson Pump the oil is first passed through a strainer, then it goes through a filter where even fine particles of sand or other foreign matter are removed before the oil is forced into the bearings, etc. Thus *all bearings and wearing parts are pressure lubricated with clean filtered oil, and should have a long trouble-free life.*

The Chain Drive is more efficient than a gear drive, and this greater efficiency produces higher mud pressure, and this in turn means lower drilling cost per foot.

Wilson has a pump to meet any need between 300 horsepower and 1250 horsepower.

BE MODERN—BUY WILSON



Wilson revolutionary chain drive means NO GEARS.

Wilson

WILSON MANUFACTURING CO., INC.
WICHITA FALLS, TEXAS
THE HOME OF RED IRON

They Say—

Review issue covers it all

Dear Sir:

We would like to obtain some monthly historical data on your Refinery Construction Index. Would it be possible for you to send us monthly data for the total index and its major components for the post-war years?

James S. Cross
Manager
Statistical Research Department
Sun Oil Co.
Philadelphia

(Editor's note: The Journal's Refinery Construction Index, prepared by Technical Editor W. L. Nelson, is published on page 273 of the Annual Review and Forecast edition, January 27, 1958. This particular plotting covers by months the total Nelson Index and its major components for the years 1946-57, inclusive.)

Family fights must go

"To counteract public misunderstanding about the oil industry's activities, operations, motives, and aspirations is not a simple thing. The situation is complicated by the wide variety of activities that take place between the search for a new source of crude and the delivery of gasoline to the motorist. This variety of activities creates some strong differences of opinion and conflicts of interest within the oil industry itself.

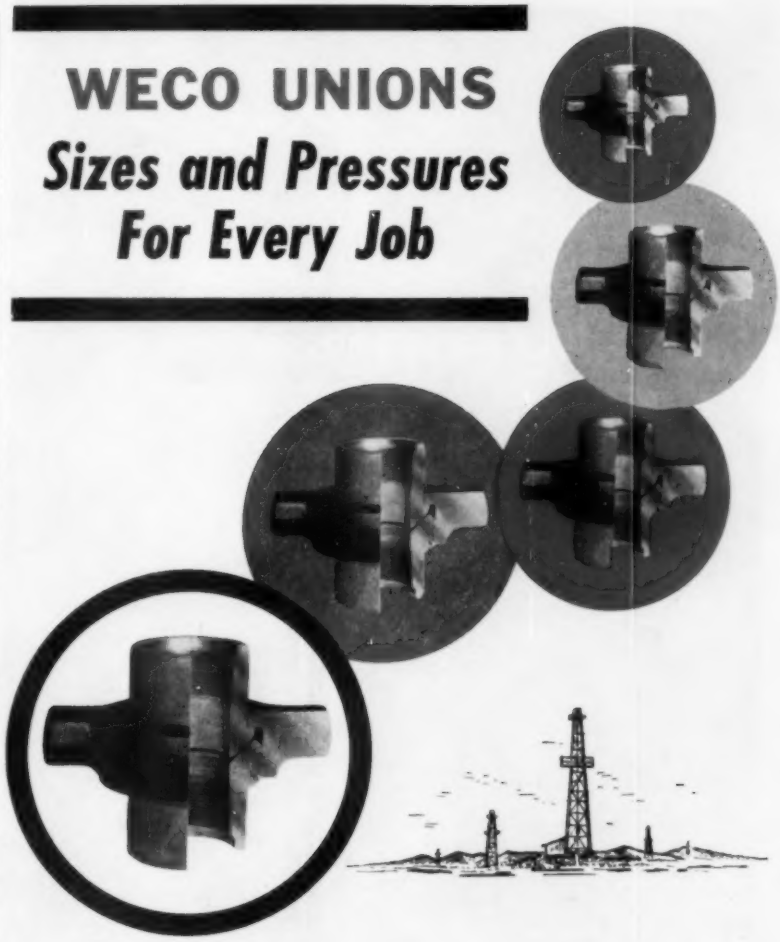
"Too often segments of the oil industry seek government help for their segment regardless of the effect on the industry as a whole.

"They are unaware, perhaps, that they are saying, almost literally, 'Free competition is good for everyone but me' and that, by asking for protection from competition for themselves and regulation of some activities of others, they are asking for regulation of all, including themselves. . .

"There is no room for bitterness, for bickering, or for continuous sharpshooting within the oil industry. And there should be no room for attempts to use public opinion as a weapon against any particular segment of our industry. It is doubtful that long-term interests of any segment can ever be served in this manner. Certainly the industry as a whole suffers."

"I am particularly disturbed by the tendency to look to Government for

WECO UNIONS
Sizes and Pressures For Every Job



1" through 12" sizes of WECO Full Circle Contact Unions meet every union need in the oil industry with perfect sealing, high performance service.

Soundly engineered with a positive sealing ball and cone seat, the components of WECO Unions are correctly proportioned to provide maximum strength and union stability in every size.

WECO Unions have pressure ranges from 1,000 psi through 15,000 psi and are available from your nearest supply store.

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS
WECO
Division of CHIKSAN COMPANY a subsidiary of FOOD MACHINERY AND CHEMICAL CORPORATION
fmc

H-F
3-TUBE
Rx for pumping abrasive fluids
If you're having to pump abrasive, sandy fluid, a Harbison-Fischer 3-Tube Rod Pump is the pump you ought to be using. Because the three concentric, free-fitting tubes use the well fluid for the plunger seal, the pump is especially efficient in handling excessive float sand, dirty fluid, and in wells with unusually high bottom-hole temperatures which cause unequal expansion of close-fitting metal plungers and barrel tubes. The free-falling plunger and small bore subject the rods to less stretch and strain, and allow faster pumping rates. Since the plunger fit is not critical, friction and excessive wear of working parts are negligible, even with sand-laden fluid. The valves are fitted with standard A.P.I. balls and seats and a no-go ring on the standing valve seats off the seating area above the hold down—important features for sandy wells. H-F 3-Tube Pumps are available in 12', 15', 18', and 25' lengths in 2" x 1¼" and 2½" x 1¾" sizes from leading stores throughout the oil patch. Your store or our factory representative in your area will be glad to give you additional details and illustrated literature without obligation.
• For hard-to-pump wells—or as a good, all-around pump for average wells—you can depend upon a Harbison-Fischer 3-Tube to make good production without frequent pulling jobs.
H-F
3
TUBE
ROD PUMP
HARBISON-FISCHER
MANUFACTURING COMPANY
FORT WORTH
"Best Pumps in the Oil Patch"®

solution of our problems. It is fallacious and short-sighted. It certainly makes misunderstanding by the public not only possible but probable."

Charles E. Spahr, president, Standard Oil Co. (Ohio), in a speech to the Cleveland Petroleum Club.

Power of the credit policy

"During booms credit is sometimes administered carelessly in the mistaken belief that favorable business conditions will justify almost any credit extension. During recessions an exaggerated fear of worsening conditions could result in a serious curtailment of credit which could help turn a mild adjustment into a depression.

"It is too early to determine how extensive the present slide (of the American economy) will be. Much will depend on what the Government will do, what business will do, and what the consumer will do in the months ahead. These key elements will determine whether the recession will be shallow or deep, of short or long durations. . .

"At least three factors will help promote future expansion: Expanding research, the surging population growth of the postwar years, the realistic outlook for adequate defense. The business cycle has yet to be controlled effectively, but the long-term prospects are bright."

J. Allen Walker, general credit manager, Standard Oil Co. of California, in a speech to the Los Angeles Rotary Club.

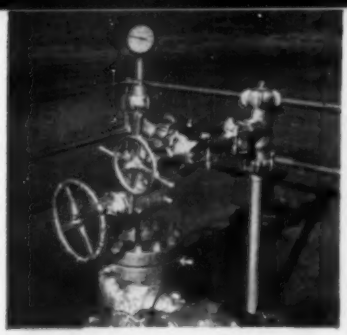
FTC acts against good faith

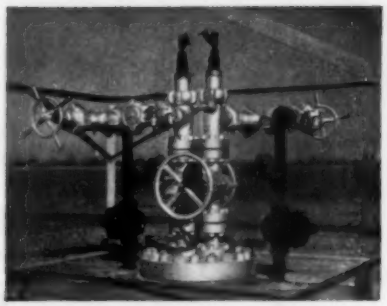
"One thing should be made clear about the Supreme Court decision upholding the Standard Oil Co. of Indiana's claim that a dual pricing system it used in the Detroit area was introduced 'in good faith' to meet a competitor's pricing policies.

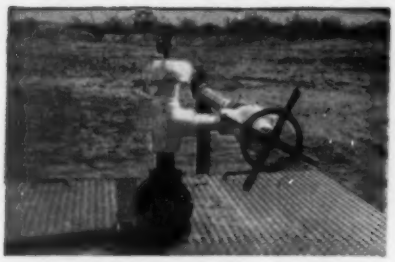
"The court has not upheld predatory pricing policies. It has not upheld collusive pricing. Nor has it approved what Justice Douglas charges in his dissent is a system under which 'a big retailer gets one price and a small retailer gets another.'

"It is clear that what the court has actually upheld is the right of a producer charged with illegal pricing policies under the Robinson-Patman Act to resort to the 'good faith' defense without first being fitted into a strait jacket so rigid and confining that such a defense is all but impossible. . .

"There have been grounds for some suspicion that FTC has never taken kindly to the principle of 'good faith' defense and might attempt in the







Nice thing about UNIBOLT Flow Manifolds . . .

you buy only what your well needs, and no more

Since well conditions and completion methods differ widely, no one Christmas tree flow control of the "fixed design" type can possibly serve all wells efficiently. Not so with UNIBOLT Flow Manifolds, the components of which may be readily arranged in any design to exactly fit well requirements.

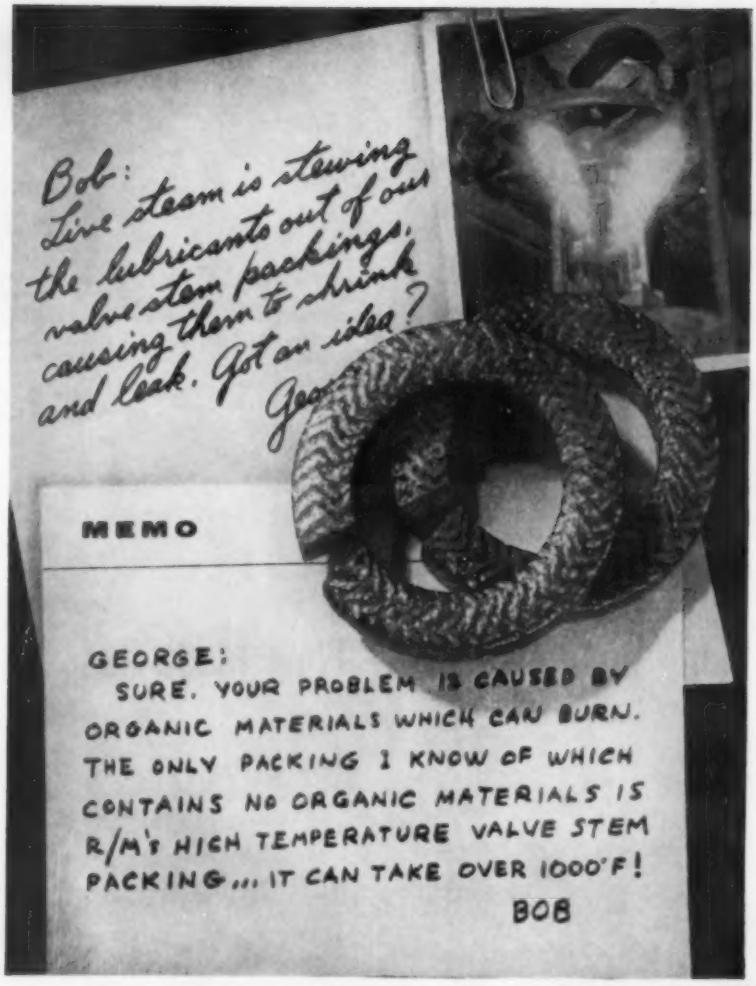
These flexible Flow Manifolds, composed of standard UNIBOLT Tees, Crosses, Adjustable Wing Valves or Chokes, can be combined in a dozen different ways. Thus, you buy exactly what is needed for a given well.

And the entire manifold may be salvaged as a unit or in separate parts for later use in other manifolds.

From the lightest screwed manifold to the heaviest high-pressure assemblies and corrosion-resistant steel, UNIBOLT Flow Manifolds can be tailored to your needs. You save steel and, at the same time, you hold capital investment to a minimum.

THORNHILL CRAVER CO.

P. O. BOX 1184 HOUSTON, TEXAS


Bob:
Live steam is stewing the lubricants out of our valve stem packings, causing them to shrink and leak. Got an idea?
Geo
MEMO
GEORGE:
SURE. YOUR PROBLEM IS CAUSED BY ORGANIC MATERIALS WHICH CAN BURN. THE ONLY PACKING I KNOW OF WHICH CONTAINS NO ORGANIC MATERIALS IS R/M's HIGH TEMPERATURE VALVE STEM PACKING... IT CAN TAKE OVER 1000°F!
BOB

Your up-to-date boilers are producing steam at higher temperatures and pressures. Old-time valve-stem packings just can't stand the gaff. You can count on Raybestos-Manhattan for the safe, sure solution—packings specially designed to meet today's higher temperatures and pressures.

R/M high temperature valve-stem packings are made of top-quality braided asbestos with Monel wire reinforcement over a high temperature resistant plastic core. They contain practically no organic materials and the lubricants are thoroughly dispersed all the way through. It is this carefully engineered construction that makes them your best possible choice for all steam valves and rods.

R/M engineers have amassed a wealth of experience in manufacturing packings and gasket materials to satisfy the most exacting requirements of industry. This experience is at your disposal—call on R/M!

R/M MAKES A COMPLETE LINE OF MECHANICAL PACKINGS—including Vee-Flex,* Vee-Square,* Universal Plastic, and "versi-pak"*; GASKET MATERIALS; and "TEFLON"* PRODUCTS. SEE YOUR R/M DISTRIBUTOR.
*A Du Pont trademark

R/M
PACKINGS
RAYBESTOS-MANHATTAN, INC.
PACKING DIVISION, PASSAIC, N.J.
MECHANICAL PACKINGS AND GASKET MATERIALS

RAYBESTOS-MANHATTAN, INC., Mechanical Packings • Asbestos Textiles • Industrial Rubber • Engineered Plastics
Sintered Metal Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings
Brake Blocks • Clutch Facings • Industrial Adhesives • Bowling Balls • Laundry Pads and Covers

future to nullify it by degrees—burdening defendants with so many strict stipulations that any kind of effective defense would become as impossible in principle as it has turned out to be in practice. . .

"If a law cannot properly be enforced unless stringent limitations are placed upon defense of those who are prosecuted under it, then plainly there is either something wrong with the law or with the prosecutors themselves."

Editorial in the New York Journal of Commerce.

CALENDAR OF EVENTS

FEBRUARY

26-28 American Petroleum Institute, Division of Production, southern district meeting, Shamrock - Hilton Hotel, Houston.

28 Natural Gasoline Association of America, Permian basin regional meeting, Lincoln Hotel, Odessa, Tex.

27-28 University of Texas, Texas A. & M. College, annual joint meeting, sponsored by student chapters, AIME, and departments of petroleum engineering, Texas A. & M. College, College Station, Tex.

MARCH

3-4 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, fourth annual joint meeting of Rocky Mountain petroleum sections, Cosmopolitan Hotel, Denver.

5-6 Gas Conditioning conference, sponsored by the University of Oklahoma, Oklahoma Memorial Union Building, Norman, Okla.

7 Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus, Ohio.

7-8 American Association of Petroleum Geologists, Pacific Coast section, annual meeting, Ambassador Hotel, Los Angeles.

10-13 American Association of Petroleum Geologists and Society of Economic Paleontologists and Mineralogists, forty-third annual meeting, Biltmore Hotel, Los Angeles.

12-14 American Petroleum Institute, Division of Production, southwestern district meeting, Hotel Texas, Fort Worth.

13-14 Fifth annual Heat Transfer Conference, Oklahoma State University, Stillwater, Okla.

17-21 International Atomic Exposition, Inc., 1958 Nuclear Congress, Chicago Amphitheatre, Chicago.

17-21 National Association of Corrosion Engineers, annual conference, civic auditorium, San Francisco.

20-21 New England Gas Association, annual meeting, Hotel Statler, Boston.

20-21 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, regional conference on production and reservoir engineering, Mayo Hotel, Tulsa.

for prompt action, specify

MATHIESON

mono-
di-
tri-

Ethylene Glycol

mono-
di-
tri-

Ethanolamines

These Mathieson organics will meet your most exacting requirements. They are produced to uncompromising quality standards at our modern organic chemicals plant in Brandenburg, Kentucky. Terminal storage facilities are maintained at: Houston, Odessa and Borger, Texas; Abbeville, Louisiana; Farmington, New Mexico; St. Louis, Missouri; Chicago, Illinois; as well as at the Doe Run plant in Brandenburg.

Bulk and drum shipments are quickly made from any of these points. Contact our sales office nearest you for information and technical data.

Ethylene Oxide	Ethanolamines
Ethylene Glycol	Ethylene Diamine
Diethylene Glycol	Polyamines
Triethylene Glycol	Surfactants (Poly-Tergents)
Polyethylene Glycols (Poly-G's)	Ethylene Dichloride
Glycol Ether Solvents (Poly-Solv's)	Dichloroethylether

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24-26 Midwest Gas Association, Broadmoor Hotel, Colorado Springs, Colo.
24-26 Western Petroleum Refiners Association, annual meeting, Hilton Hotel, San Antonio, Tex.
26 Petroleum Equipment Suppliers Association, southwestern district meeting, Shamrock-Hilton Hotel, Houston.
27-29 American Institute of Mining, Metallurgical, and Petroleum Engineers, Pacific Southwest conference, St. Francis Hotel, San Francisco.
29 North Texas Oil and Gas Association, annual meeting, Kemp Hotel, Wichita Falls, Tex.
23-30 Mexican Association of Petroleum Geologists, Mexico City.
31-April 2 American Petroleum Institute, Division of Transportation, annual pipeline conference, Jung Hotel, New Orleans.
31-April 2 American Institute of Electrical Engineers, southwest district meeting, Mayo Hotel, Tulsa.

APRIL

1-3 University of Oklahoma, fifth annual conference on corrosion control, Extension Study Center, Norman, Okla.
2 Petroleum Equipment Suppliers Association, eastern district meeting, Duquesne Club, Pittsburgh.
8 American Institute of Chemical Engineers, Philadelphia-Wilmington section, University of Pennsylvania, annual meeting, University of Pennsylvania campus, Philadelphia.
9-11 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Biltmore Hotel, Oklahoma City.
13-18 American Chemical Society, national meeting, San Francisco.
15-17 University of Oklahoma, thirty-fourth annual gas measurement short course, North Campus, Norman, Okla.
16-18 Natural Gasoline Association of America, annual convention, Baker and Adolphus Hotels, Dallas.
16-18 National Petroleum Association, fifty-fifth semiannual meeting, Hotel Cleveland, Cleveland.
17 Petroleum Equipment Suppliers Association, Pacific district meeting, Beverly-Hilton Hotel, Los Angeles.
17-18 Texas Technological College, fifth annual West Texas oil lifting short course, Lubbock, Tex.
17-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, Louisiana-Arkansas, East Texas, and Mississippi petroleum sections, gas technology symposium, Shreveport, La.
17-18 Geophysical Society of Tulsa, Tulsa Geological Society, annual midwestern exploration meeting, Tulsa.
17-19 American Institute of Mining, Metallurgical, and Petroleum Engineers, Pacific Northwest regional conference, Spokane, Wash.
20-23 American Institute of Chemical Engineers and Chemical Institute of Canada, chemical engineering division; Canada-U.S. chemical engineering conference, Montreal.
21-23 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Cosmopolitan Hotel, Denver.
23-25 Second International Williston Basin Symposium, sponsored by Saskatchewan Geological Society and North Dakota Geological Society, Regina.
27-30 American Association of Petroleum

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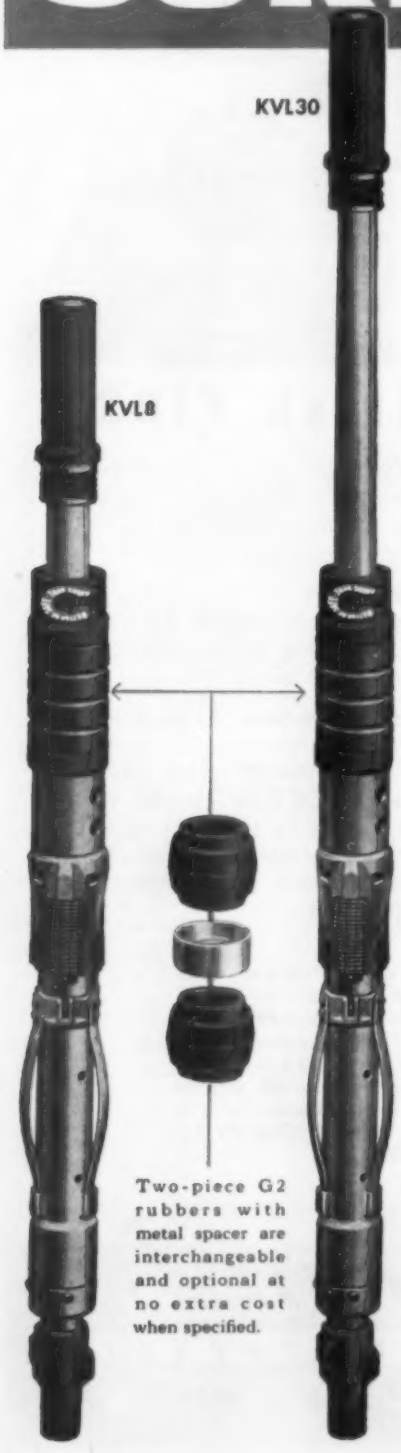

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28-29 University of Oklahoma, third annual conference on automatic control in the petroleum and chemical industries, Oklahoma Memorial Union Building, Norman, Okla.

28-29 Independent Petroleum Association of America, mid-year meeting, Sherman Hotel, Chicago.

28-30 Southern Gas Association, annual convention, Dallas.

29-May 1 Petroleum Industry Electrical Association, Petroleum Electric Supply Association, annual joint meeting, Adolphus Hotel, Dallas.

MAY

5-6 Society of Petroleum Engineers of AIME, North Texas section, secondary-recovery symposium, Wichita Falls, Tex.

5-7 Purdue University, thirteenth annual industrial waste conference, Purdue Memorial Union Building, Lafayette, Ind.

5-9 American Gas Association, distribution, production, and transmission conference, Roosevelt and Commodore Hotels, New York.

7-9 American Petroleum Institute, Division of Production, eastern district meeting, Deshler-Hilton Hotel, Columbus, Ohio.

8-9 Texas Petroleum Research Committee, eleventh oil recovery conference, symposium on "A Century of Texas Oil, 1875-1975," University of Texas, Austin.

11-14 Texas Independent Producers and Royalty Owners Association, annual membership meeting, San Antonio, Tex.

12-14 Chemical Institute of Canada, National Research Council, eighth Canadian high polymer forum, Macdonald College, St. Anne de Bellevue, Quebec.

12-14 Instrument Society of America, symposium of analysis instrumentation division, Shamrock Hilton Hotel, Houston.

12-15 American Petroleum Institute, Division of Refining, midyear meeting, Statler Hotel, Los Angeles.

20-22 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

21-23 Rocky Mountain Oil and Gas Association, thirteenth annual convention, Cosmopolitan Hotel, Denver.

21-23 American Petroleum Institute, Division of Marketing, midyear meeting, Roosevelt Hotel, New Orleans.

22-23 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

26-28 Chemical Institute of Canada, annual conference and exhibition, Royal York Hotel, Toronto.

JUNE

2-4 Petroleum Electric Power Association annual meeting Texas Hotel, Fort Worth.

5-7 National Oil Scouts and Landmen's Association, annual meeting, Mayo Hotel, Tulsa.

8-11 American Petroleum Institute, Division of Transportation, annual tanker conference, Greenbrier Hotel, White Sulphur Springs, W. Va.

10-12 Appalachian Underground Corrosion Short Course, School of Mines, West Virginia University, Morgantown, W. Va.

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JOURNALLY SPEAKING

"Workin' on the Journal"

BELIEVE IT or not, this is a picture of men at work.

It is five Journal editors working hard to entertain their colleagues with an unrehearsed barbershop rendition of a little ditty that started out "We've been workin' on the Journal, day after cotton-pickin' day," and got cornier as it went along.

If you think this should come under the head of play, not work, it was the only such interlude in a hard-working, 3-day conference of all our 43 editors, gathered in Tulsa from the far reaches of the continent.

The purpose of this annual confab, of course, was to lay plans for making our favorite oil publication even better during the coming year. And, as the song said, the staff really worked ON the Journal. They worked on it and worked it over, with expert hand and critical eye, from cover layout to advertisers' index.

To give you an idea of how these workshop sessions went, a couple of them were entitled "Organizing the Staff-Written Technical Article for the Reader," and "Streamlining Exploration News and Statistics." Each of a score of such topics had been assigned to an experienced staffer, and when he got through, the rest of the boys and girls had a chance to tear him to pieces—if they could.

You probably aren't so naive as to assume that a magazine just edits itself, but you'd have been amazed at the technical know-how and journalistic savvy that began flying around when our gang went into action. If you could have eavesdropped on these specialists (combining more than 600 years of oil-writing experience) you would have got the answer to the oft-asked question: How do you manage to put out so much stuff all the time?

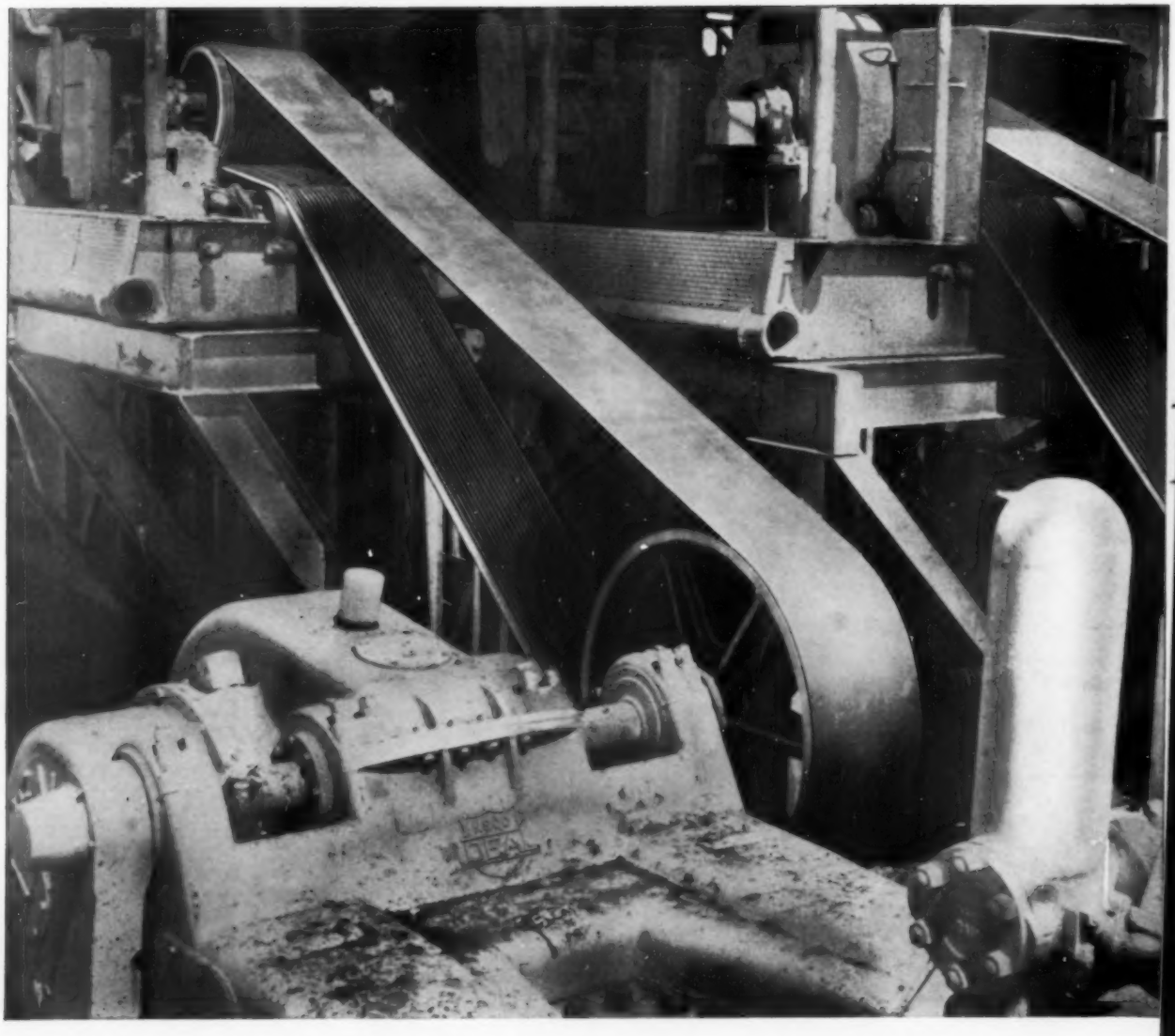
Those of you who may have been around that long know that the old Yellow Book has been blanketing the oil patch since Spindletop. And you may have noticed that it isn't the same now as it was 20, or 10, or even a couple of years ago.

That's because journalistic techniques and reader habits change just like engineering techniques and consumer demands change. At these annual editorial conferences we try to anticipate reader preferences and determine how to meet them with the most appropriate old and new reportorial and presentational skills and devices, just the way Detroit tries to anticipate tomorrow's trends in automobiles.

We're not going to tell just what plans we cooked up, any more than General Motors is going to reveal the styling of its 1960 models. That may not be a very apt comparison, because we're not contemplating any radical model changes—just general improvement all around. We think we are doing fairly well at present, but we've doped out some ways to do even better.

So watch the Big Yellow Book closely in the months to come, and you'll discover that it not only has still more vital information but it is presented in still more readable fashion. Then you'll see how we've been working on the Journal.

—Henry D. Ralph.



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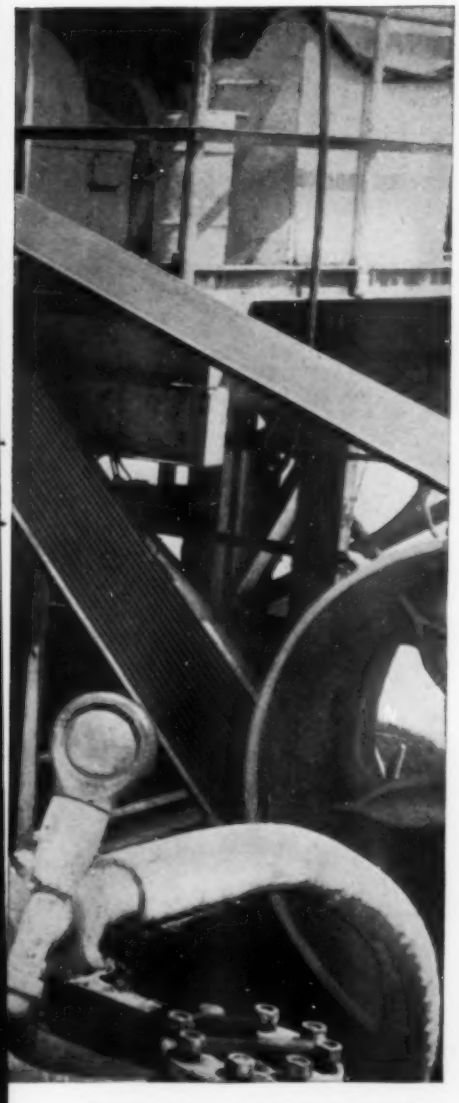

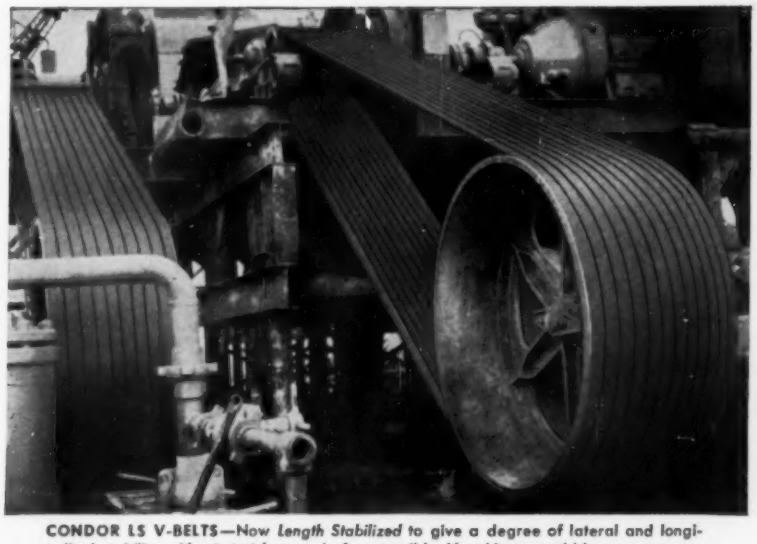

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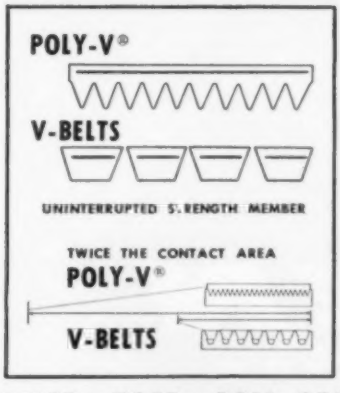

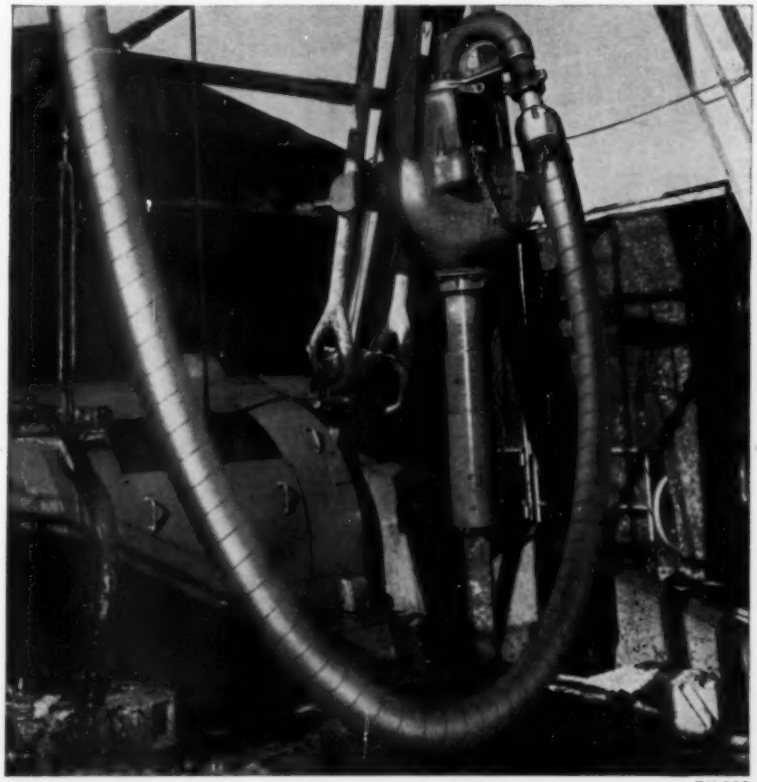

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There's a big market left— why ruin it with oversupply?

THE bottom hasn't dropped out of the oil business, but there's no denying that the industry faces a crisis. And things are very likely to get worse unless there is some drastic surgery that will lop off a big hunk of supply in a hurry.

The crumbling price structure for both crude and products, homeless crude, cuts in refinery runs—all these are symptoms and penalties of a condition that has been obvious for many months.

Economists may call this condition an inventory maladjustment, but in plain language there's just too damn much oil. Too much crude above ground, too much product in refiners' storage, too much oil being produced and imported.

A "CLEARANCE SALE" would be the proper remedy in some industries—slash prices, take your medicine, clean out your inventories, and then start afresh on a new basis.

If lower prices for oil would increase consumption or reduce production, then the oil industry ought to take a big dose of castor oil and have a whopping stock-reduction sale. But price cuts won't affect demand, production, or inventories enough to put in your eye.

So the current price slippage only aggravates and complicates the ailment rather than signaling a turn for the better.

A lot of people can say "I told you so." The storm warnings have been plain enough. But there's little use fixing blame unless it leads to correction. In this case, practically everybody is to blame. Hardly anyone, here or abroad, would believe that the market was satiable.

It's too late now for mild palliatives. Demand is poor, and this is the season of the year when demand always starts down a 6-month toboggan. Little nibblings at the oversupply won't be effective.

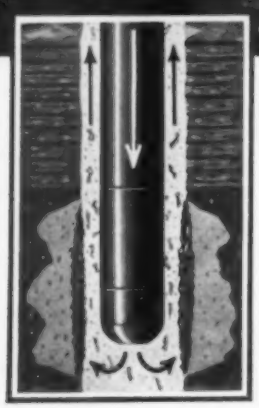
TO GET OUT OF THIS CRISIS, supply must be reduced in one way or another—or by all possible ways at once—and quickly.

Refinery runs must be held down, but the primary responsibility for action rests with crude suppliers.

Prorating states must pay more attention to purchasers' nominations, nation-wide stocks of all oils, and actual market conditions, and less to what producers, royalty owners, and tax collectors want. Where this isn't effective, purchasers must do more prorating themselves.

Imports, perhaps, can't be reduced rapidly. But some way must be found to keep them from rising in the near future. If the present imports program can't assure this, a tighter law seems inevitable.

There is still demand for a good many millions of barrels of oil in this country every day, and always will be. But unless oversupplying is stopped, the identical number of barrels will be consumed at prices ruinously low to all suppliers.



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the OIL AND GAS JOURNAL

February 24, 1958

Oil Throttles Back to Shrink Surplus

Producers and refiners are racing with time to get supplies in balance with demand before price structure breaks. Texas goes on all-time low 9-day producing pattern. There's an air of crisis in industry actions.

THE OIL INDUSTRY is beginning to slam the brakes on its huge productive capacity in an effort to avert a general collapse in prices of both crude and products.

In a series of actions across the country last week, industry and government officials moved to:

... **Cut back production** of crude drastically to avoid further flooding the market.

... **Ease off refinery runs** even in advance of the normal downturn in demand usually experienced in the March-May period.

... **Adjust prices on crude** in selective areas, based on their intrinsic value to the refiner.

... **Hold the line on imports** of foreign oil to prevent this crude from moving into the market slack created by lowered domestic production.

Oil men generally hope these actions will be continued long enough so that consumers can bring down the surplus of products. With heavy inventories worked off, they think more normal patterns of marketing crude and products can be resumed and the price structure saved from a general break.

How long? . . . The question of how long the emergency is expected to last has many answers.

The Independent Petroleum Association of America warns that domestic crude-oil producers can expect further declines during the next 3 months.

IPAA economists give this rundown:

... **Demand** is still sluggish. Domestic consumption in last 3 months was 2.3 per cent lower than year ago. The March-May outlook is for a demand level unchanged from 2 years ago but up 2 per cent from last year.

Trend in Texas Allowables

	Producing Days	Allowable in bbl.
1956		
July	16	3,322,043
August	16	3,384,744
September	15	3,297,954
October	15	3,279,697
November	15	3,314,390
December	16	3,442,952
1957		
January	16	3,421,058
February	15	3,543,672
March	18	3,733,054
April	16	3,564,665
May	16	3,474,834
June	15	3,434,618
July	13	3,027,786
August	13	3,067,883
September	13	3,127,506
October	12	2,964,062
November	12	2,998,927
December	12	2,987,415
1958		
January	12	2,985,350
February	11	3,057,936
MARCH	9	2,517,249

... **Inventories** are becoming troublesome in view of poor demand trends. Total inventories are 82 million barrels higher than last year and 39 million higher than IPAA forecast.

... **Imports** into area west of the Rockies in next 3 months are expected to exceed Government-recommended quotas by 60,000 bbl. daily.

... **Production** outlook is for domestic crude market of 6,800,000 bbl. daily during next 3 months. Estimated February production will exceed this by 125,000 bbl. daily.

P. S. Magruder, executive vice president of General Petroleum Corp., declared he hoped normal operations might be resumed by midsummer. This, he said, will depend on how successfully inventories can be reduced to a sound level.

M. J. Rathbone, president of Standard Oil Co. (N. J.), sounded the sentiments of most majors when he appealed to the industry to make the necessary refinery adjustments to avert a price break.

He declared a general price cut in crude or products at this time would accomplish nothing. He even said cuts might aggravate the situation.

"What is needed," Rathbone said, "is less refinery runs and consequently less products and the ability to work off burdensome stocks."

Cities Service Co. observed that supplies of refined products have been top-heavy for many months. General industrial activity and consumer demand have failed to hold to expected levels, and the result is a supply-demand picture so distorted throughout the industry that simple business prudence requires remedial action without delay.

Production trimmed . . . The big prorated states all made drastic cuts in March production.

Louisiana and New Mexico sliced allowables to record lows. Texas got down to its all-time low number of producing days. Oklahoma officials indicated they will follow next week with a slash.

Big cut in Texas . . . The Texas Railroad Commission made the most heroic effort of all to bring down production. Spurred by strong independent producer groups, the commission ordered a 9-day producing pattern for the state.

This means an initial allowable of

HOW THIN TO SLICE is the question for these Oklahoma independents who spoke at last week's emergency session in Oklahoma City. Mack Braly, Ada, left, favored a minimum cut. Roy Johnson, center, asked for a slowdown, not a shutdown. Allen Calvert, Tulsa, declared the only solution to the present crisis is a deep production slash.

2,517,249 bbl. daily for March. It represents a cut of 540,687 bbl. daily from the initial February allowable and 504,289 bbl. daily from the effective allowable on February.

The 9-day producing pattern is the lowest in Texas history and marks the fourth record low set since the Suez crisis. Before that 15 producing days were the lowest.

The other cuts . . . Louisiana officials announced a 40,000-bbl. reduction in March allowables, bringing permitted production to 763,000 bbl. daily.

Actual Louisiana production is expected to run 55,000 bbl. daily below that figure, however. Underproduction probably will be increased also by pipeline proration.

Most of Louisiana's allowable reduction will result from a revised depth-bracket formula. Wells will be permitted to produce only 33 per cent of the standard allowable set in March 1953. Certain onshore wells in South Pass Block 24 field also will lose their offshore bonus.

New Mexico's Oil Conservation Commission ordered a basic unit allowable of 35 bbl. daily per well in southeastern fields and 10 bbl. for the northwest. It's a 2-bbl. daily cut and the lowest figure since the state began prorationing.

The move is expected to reduce oil production by 5,628 bbl. daily, putting the allowed production at 279,681 bbl. daily. Purchasers had nominated only 206,299 bbl.

Purchasers in Oklahoma asked for a 50,000-bbl. daily cut in March production. Independent producers also recommended emergency measures to reduce the allowable. Gov. Raymond Gary and members of the Corporation Commission indicated a sizable cut will be made this week.

Buyer proration . . . Oil buyers moved more quickly than state officials.

Many announced cuts in March purchasing which in some areas will result in purchaser proration. These reductions included:

. . . Cities Service—2,000-bbl. daily cuts in Louisiana and New Mexico and 17,000 in Texas.

. . . Rock Island Refining—25 per cent cut in Oklahoma.

. . . Gulf—30,000-bbl. daily cut in Louisiana.

. . . Suntide Refining—10,000-bbl. daily cut in South Texas.

. . . Socony Mobil—4,000-bbl. daily in Kansas.

. . . Pure Oil—cut maximum per well runs in Denver-Julesburg basin to 65 bbl. daily from 125-150 bbl. daily.

. . . General Petroleum — shut in 6,000 bbl. daily or about 10 per cent of its California production and cut imports from Canada about 6,100 bbl. daily.

The refinery picture . . . Processors took a double look at their troubles.

Many found partial solutions in selective price cuts and in reducing crude runs.

Kermac Poses

OKLAHOMA independents are aroused by a break with tradition by Kerr-McGee Oil Industries, Inc., to make the producer pay for gathering and moving his oil to the refinery.

Kerr-McGee, itself an integrated Oklahoma independent, last week announced it was amending division orders to make producers pay a 15-cent per barrel gathering charge. The levy was assessed upon all crude gathered in northeastern Oklahoma by Kerr-McGee and then moved to its own plants.

Gathering and pipeline charges traditionally are paid by the refiner.

Kerr-McGee's announcement declared the action was taken to offset part of the increased gathering and pipeline transportation charges which the company no longer can absorb. Crude price postings remained unchanged.

The area affected lies north of the South Canadian River and east of the Indian Survey Meridian. About 48,000 bbl. daily of crude is involved.

Kerr-McGee described this area as containing mostly stripper wells. Production per lease is small. Kermac said this has increased gathering costs to a point where Oklahoma crude oils now cost more to deliver to the refinery than many comparable out-of-state crudes.

The reaction . . . Producers quickly protested paying the charge.

The Oklahoma Independent Petroleum Association held a public meeting in Oklahoma City. Association directors later approved a resolution condemning the charge.

Oil producers speaking up at the

The parade of refiners announcing plant cutbacks included:

. . . Continental, 5,000 bbl. daily at Lake Charles, La.

. . . Esso Standard, down 25,000 bbl. daily from October-December average.

. . . Phillips, 19,000 bbl. daily.

. . . D-X Sunray, 11,500 bbl. daily for February and another 5,000 bbl. daily in March.

. . . Cities Service, 20,000 bbl. daily at Lake Charles.

. . . Indiana Standard, 74,000 bbl. daily in January with further cuts of 40,000 bbl. daily in February and March.

. . . Suntide, 10,000 bbl. daily at Corpus Christi.

New Issue: Who Pays for Gathering?

hearing claimed the 15-cent gathering charge was:

. . . A price cut by subterfuge. In any case their net back at the well is 15 cents a barrel less.

. . . Worse than a price cut. They pay the Oklahoma gross production tax on the posted price which remains unchanged. Thus they are paying tax on a larger base.

. . . Violation of a contract. A division order, these men said, is a valid contract which cannot be breached unilaterally.

. . . A change in common-carrier rates without authority. They claimed the Kerr-McGee gathering system is a common carrier and its charges should be subject to control by the Oklahoma Corporation Commission.

Only vague suggestions were made on any steps to counter the charge. These included asking the U. S. Attorney General to investigate antitrust aspects of the charge, and asking the Corporation Commission to exert jurisdiction over rates for gathering.

Dean A. McGee
. . . breaks with precedent.

The case for Kerr-McGee . . . The Kerr-McGee position was laid out frankly by Dean A. McGee, the company president, in an exclusive interview with the Journal.

McGee said operating a gathering system in the stripper-well area of northeastern Oklahoma is a losing proposition. He said Kerr-McGee has been able to effect many economies since taking over the system from Gulf Oil Corp. this year, but costs still are above the 15-cents now being passed on to producers for gathering.

McGee declared the step was taken only after extensive studies of the company's crude supply, refining, and marketing picture. He said Oklahoma crude prices are higher than oil from competing states, where many adjustments have been made in the past year. The only market for Oklahoma oil out of the state is in the Great Lakes area. There it has a price disadvantage with oil from the Rockies, Illinois basin, Michigan, and recently from other sources up the Mississippi River.

Kerr-McGee refines only Oklahoma crude but markets in 17 states. In its marketing operations it sells in competition with refiners whose products are made from cheaper crude.

These facts of life, McGee said, forced his company to take a hard look at its costs. The decision to ask producers in the stripper area to share part of the gathering costs rather than to cut the posted price in all areas where it buys was based on belief that:

. . . Area which causes the greater costs should share them.

. . . Areas where production is more efficient should not be penalized by a general price cut.

Other answers . . . McGee took up other points. They were:

. . . Taxes. Producers, he said, have some advantages which offset the posting-price base for their gross production taxes. They can deduct the gathering charge from gross income as a cost of doing business. Their depletion allowance also is computed on the posted-price base.

. . . Contracts. McGee said the division order is a contract. But it can be changed by either party upon notice, and this was done.

. . . Common-carrier rates. McGee said his company's gathering system handles only crude which it has bought and is moving only to company plants. This type of carrier is not subject to rate controls.

What's ahead? . . . The Kerr-McGee move away from the traditional pattern had oil companies officials over the state buzzing.

Paul Schultz, president of the OIPA, said Kerr-McGee ships and markets in the same area as several other Oklahoma refiners. He feared the others would not stand still long and would impose similar charges.

Spokesmen for other refiners and pipeline companies operating in the state, however, reported they had no plans to charge the producer.

. . . Eastern States, 6,000 bbl. daily.

The price cuts involved crudes in local areas in Texas, Oklahoma, Wyoming, Montana, and Ohio.

Sinclair Crude Oil Co. posted a 10-cent cut on Southern Oklahoma sour crude, giving a new top price of $2.95 a barrel. It cut Southwest Texas and Gulf Coast light and heavy 15 cents to tops of $3.20 and $3.30 and made a similar cut in North Texas, where the top is $3.08.

American Petrofina, Inc., widened the 15-cent cut to 11 counties in North Texas, making it an across-the-board reduction. Bell Oil & Gas Co. also cut in North Texas and included in the reduction a small amount of crude it picks up across the Red River in Cotton County, Oklahoma.

Other Oklahoma buyers met the new posting in southern Oklahoma and Texas buyers made corrections on the Gulf. Ingram Oil & Refining Co. cut 40 cents a barrel from the price it paid for distress oil in the Houston area. Eastern States Petroleum & Chemical Corp. cut 50 cents from its posting for oil from Pierce Junction field near Houston.

Cosden Petroleum Corp. posted an 8-cent lower price for crude in four fields in Howard and Glasscock counties, West Texas, where the new top became $3.08.

Continental Oil Co. lowered prices 8 cents a barrel for sour crude in five Wyoming and Montana fields and cut the top of the gravity schedule down to 34.9°.

Joseph Seep Purchasing Agent of South Penn Oil Co. brought Ohio-produced Corning-grade oil down 5 cents to $2.72 a barrel. Ashland Oil & Refining Co. made the same cut and in addition lowered the price for Zanesville Pennsylvania-grade crude 32 cents to $2.72.

All the cuts were described as moves to correct certain overvalued crudes or to make some crudes more competitive. The reductions, however, left the main price structure in a dangerous position.

These are the prices oil men are trying frantically to protect by cuts in production and refinery runs.

Pressure Forcing Import Policy Change

New importers are asking big quotas, but domestic demand is down. Cabinet committee must decide what to do about inland refiners and importers who disregard quotas. Present importers may be asked to cut back voluntarily.

THE CABINET crude-oil committee will act next month to iron out a badly wrinkled import situation.

A flood of quota requests fast nearing 300,000 bbl. daily will make necessary some new policy decisions.

But the committee will try to work out a formula under which the import program will retain its voluntary nature.

Some officials doubt that the present program could be made mandatory without another finding by the Office of Defense Mobilization that imports are excessive.

They point out that former Mobilization Director Arthur S. Flemming's report to the White House last year was based on conditions then existing. They believe that another inquiry would have to be made under Section 7 of the Reciprocal Trade Act and imports again certified to be threatening national security.

No solution yet . . . The pros and cons of mandatory control have been under intensive study. None of the many ideas offered has been found satisfactory.

The ideas include a flat maximum quota to be parceled out among importers, country quotas, and a system under which each refiner would be allowed to bring in a percentage of his plant capacity.

Even if a workable mandatory system can be found, officials are certain it would be challenged in the courts by companies whose quota requests were cut down or denied.

On the other hand, it is pointed out that the voluntary system is flexible and permits changes in import levels as domestic demand shifts. Mandatory controls would make necessary formal and time-consuming procedures before changes could be made.

The issue will be debated by some 30 witnesses who have asked to testify before the House Ways and Means Committee in hearings on extension of the trade program which started last week.

The big problem the cabinet committee faces is whether imports are to be cut back further. The present import target is 771,400 bbl. daily. But pending applications which will have to be granted will add many thousands of barrels, even if cut to a minimum.

With domestic demand at a low level and predicted to go still lower, pressure is building up for a further cut in foreign crude. It would be necessary to ask all present importers to reduce their entries if the import level is to be readjusted.

The inland refiners . . . A 2-week parade of quota seekers has passed before Capt. M. V. Carson, Jr., program administrator. Among them was a number of inland refiners who would not themselves process imported oil.

Their pleas raised another issue the cabinet committee will be asked to settle. The issue: Should inland refiners be permitted to make trades with coastal operators?

If trades are permitted, the inland refiners would be the importers of record. They would be allowed to turn their foreign crude over to others for processing and then take the products.

Cut is coming . . . While import requests already run above 250,000 bbl. daily, it is expected that they will be cut by Carson to possibly 75,000 to 100,000 bbl. a day.

Not all of the requests have been heard by Carson. Another series of hearings probably will be run in the near future.

But even 75,000 to 100,000 bbl. a day in new quotas will create a problem for the cabinet committee: Whether the present importers should be asked to cut quotas so that newcomers can be fitted in without raising the import total.

Most of the importers have cooperated in the program. But there is uncertainty as to how far they can be cut back without resistance.

A review of the first 6 months of the program shows that crude imports in the four districts were within 3.3 per cent of the recommended 771,400 bbl. daily, Carson said.

Only 8 out of 26 importers exceeded their allotted levels. Five of these eight were fully committed to comply with the program, Carson pointed out, and he believes the five will adjust their imports during the current 6 months to average out correctly by next June 30.

Carson said the three companies which have not yet agreed to cooperate are Eastern States Petroleum & Chemical Corp., Sun Oil Co., and Tidewater Oil Co.

Eastern States has a quota of 18,300 bbl. daily. Its imports for 6 months average 24,800 bbl. per day, 35 per cent above allocation. If the company is to comply fully it will have to limit imports to 11,900 bbl. per day through the first half of this year, Carson said.

Sun, with an allocation of 50,400 bbl. daily, averaged 59,200 bbl., or 17.4 per cent over quota. To comply fully, it would have to cut back to 41,700 bbl. daily.

Tidewater has a quota of 34,200 bbl. a day for its East Coast refinery. In the last half of 1957 it averaged 68,700 bbl., or more than 100 per cent over its allocation.

Delta-Superior . . . Meanwhile, another import headache plaguing Carson was eased last week—but only slightly.

E. Constantin, Jr., whose Delta Refining Co. has imported crude from Venezuela without notice to the Government, said he would apply the first two shipments against a future quota—if the quota is "workable." Delta is asking 20,000 bbl. daily.

Delta's supplier, Superior Oil Co., issued a press release stating it wishes to cooperate with the voluntary import program and opposes mandatory controls.

Superior's president, Howard B. Keck, said he told Commerce Sec. Sinclair Weeks and Carson that Superior is not an importer or refiner and does not intend to enter these fields. Keck said Superior would adhere to present contracts for sale of its Venezuelan crude but would make no others without first meeting with Weeks and Carson.

California objects . . . From California producers last week came a plea for immediate reduction of imports into District 5 from its present 220,000 bbl. daily quota to 130,000.

The Oil Producers Agency of California told Carson in a letter that supplies piled up at the rate of 35,000 bbl. daily in January and would continue to mount even though importer

nominations through July are 45,000 bbl. daily under the present quota.

The agency said demand is down 10 per cent from a year ago, and stocks reached a record high of 145.5 million barrels by the end of January. This is 40.4 million above the same day a year ago.

B.C. Test Hits

to give province its seventh oil field; activity now high.

THE FIRST DISCOVERY of 1958 for British Columbia, and the seventh oil field in this big gas province, were indicated last week in drill-stem tests of a wildcat 4 miles northwest of Milligan Creek oil field.

Triad Oil Co., Ltd., recovered 3,500 ft. of clean oil from the Triassic "D" zone in its 1 Beatton River wildcat. It is Triad's first strike in the province. The test is on B.C. Permit No. 167.

The discovery comes at a time when activity in the province is at an all-time high. Twenty-seven rigs are now running, and 25 of these are on wildcats.

Hub of the activity is Fort St. John. Earlier this month the Texaco-N.F.A. 7 Boundary Lake well, 41 miles northeast of Fort St. John, was capped as a three-zone gas discovery after flowing 11,000 M.c.f. daily on drill-stem tests of the Permo-Penn zones. Two Triassic zones also had good gas flows.

Phillips Petroleum Co. is the most active operator in the province with six rigs running. Sinclair is drilling three wildcats, and two tests are either under way or scheduled by Texas Co.-N.F.A. group, Pacific Petroleums, Ltd., Triad Oil Co., Ltd., Gulf States Oil Co., and Union Oil Co.

Memphis Arguments Urged

THE JUSTICE Department is shooting for a midsummer Supreme Court decision in the Memphis case.

A motion to have argument set for April 28 has been filed with the court by Solicitor General J. Lee Rankin. If granted, it would make possible a decision before the end of the court's term.

FPC Chairman Jerome K. Kuykendall says pipeline expansion has been almost completely halted.

If the high court affirms the decision, it will take the FPC up to 18 months to study the case and make a ruling on a rate increase application.

"I think if the consumers think they have won a victory in the Memphis case, they are in error," Kuykendall declared.

watching WASHINGTON

. . . with Bertram F. Linz

• FPC wants a little more freedom

THE FEDERAL POWER COMMISSION is restive under reins held tight by the Justice Department and Budget Bureau.

The commissioners would like to make their own decisions as to what cases should be appealed to the Supreme Court. But they have to get Justice Department approval before they can move.

Sometimes the department says no when the FPC thinks it should say yes. Then the commission has to accept decisions which it feels it could have reversed, if given a chance to argue.

The FPC also would like to submit its budget direct to Congress instead of detouring by way of the Budget Bureau.

The way it works now, the plea for money must first be approved by the budget officials. Most of the time, apparently, they cut the amount the FPC asks for before it goes to the Capitol.

Congress has a habit of shaving down the funds requested by the federal agencies. It makes a showing of hard-headed economy, even though it knows the cuts will have to be restored in a supplemental-appropriation bill.

But the FPC believes that if it could take its money problems direct to Congress it would stand a better chance of getting more of what it asks.

• Supreme Court getting more liberal

A DEFINITE SPLIT appears to be growing in the Supreme Court. And the strength of the "liberal" bloc could mean tough going for big business.

Chief Justice Warren and Justices Black, Brennan, and Douglas comprise the liberal group.

Justice Burton heads the conservative side, toward which Harlan and Whittaker appear to lean.

Clark often votes with the conservatives. Frankfurter, always independent, moves from side to side. That could give one or the other the deciding vote in vital oil and gas cases that are coming up.

The split was clearly shown in the 5-to-4 decision by which Standard Oil Co. (Ind.) won its good-faith "Detroit case" last month. The opposing votes were cast by Warren, Black, Douglas and Brennan.

Due to come before the court soon are the Memphis decision and other important gas cases. Also the gulf states' boundary suit. It will be interesting to see how the court divides on these issues.

• Truckers leery of ICC registration bill

THE INTERSTATE COMMERCE COMMISSION has sent a bill to Congress which would require private motor carriers to register.

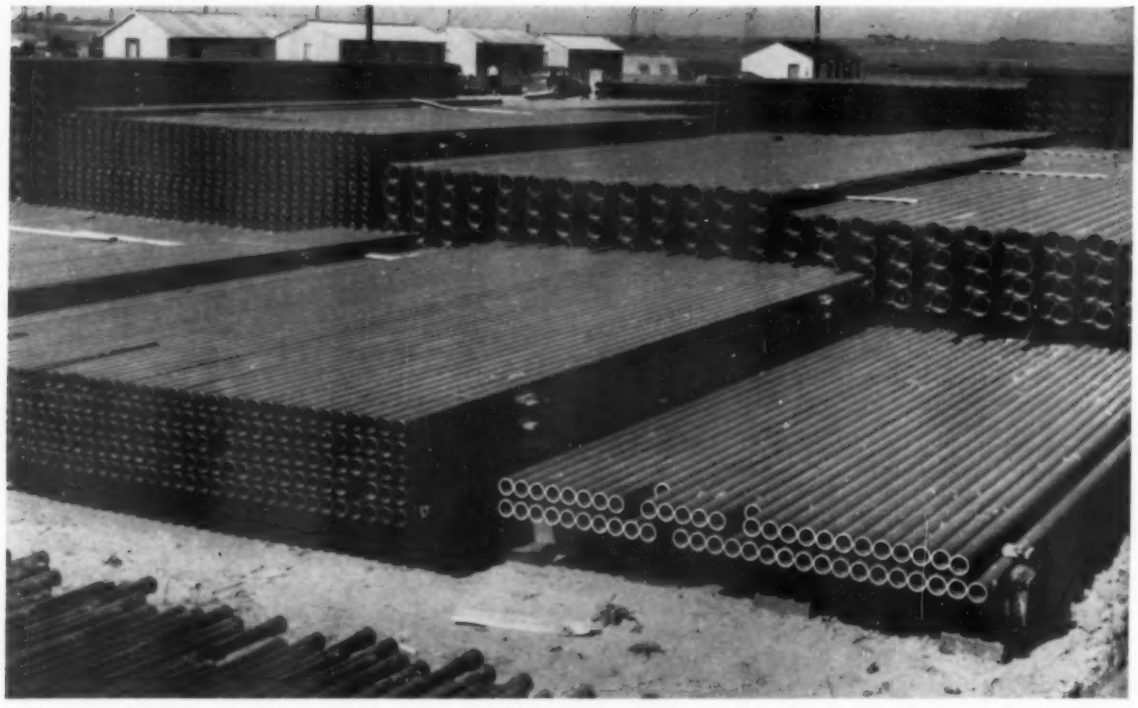
The ICC says it wants merely to build up a mailing list for its safety and hours of service regulations. But oil company and other owners of highway truck fleets are suspicious.

If the bill passes, 140,000 private and for-hire carriers, with more than 1 million trucks, would have to register annually.

Fleet owners defeated a similar bill last year, but the ICC did not give up. Many serious accidents are traceable to ignorance or disregard of safety regulations, it told Congress.

The ICC says all it wants is a postcard each year showing the name and address of the fleet owner and the number of trucks he operates. That will enable it to send out information and educational material.

But truck owners now exempt from the act don't like the idea. They fear that once the ICC gets them on its little list it will be only a matter of time before it finds it necessary to regulate their operations as well as their safety practices.



TUBULAR GOODS are available everywhere—and quickly—so inventories like this can be used. That's one big reason. . .

Oil Men Are Buying Less—Temporarily

THE LULL IN BUSINESS is pinching some equipment manufacturers, but oil men say a pickup is coming soon.

Steel production is far below capacity; pipe mills are waiting on orders; and many equipment makers have laid off personnel or gone to a 4-day week until oil-industry buying gets back to normal.

Buying usually is below par at this time of year. And recession talk has many oil companies tightening up their operations generally. But the biggest cutback—in tubular goods—isn't causing much worry.

Oil men are using tubular goods; they're just not buying any. The reason is that they have big inventories—and have tried to keep them big ever since World War II.

With steel growing more and more plentiful, they'd prefer to buy for current needs—as they did before the war. So they quit stockpiling, and they're using up their inventories.

This cutback in buying came at a time when the steel industry was setting new records in tubular-goods and line-pipe production. So, supply is now at an all-time high.

But when current stockpiles are used up, oil men say, tubular goods buying will pick up again.

Equipment manufacturers, like oil companies, find room for optimism in the present slowdown.

Even those turning to a shorter work week or laying off employes are confident that their own bulging inventories will start moving out within a few weeks as oil companies reduce their inventories and start buying again.

The shorter week seems to be preferred to layoffs because manufacturers don't want to be without their skilled workers when sales pick up.

Oil-company comments . . . Purchasing agents generally agree that their buying habits are not much different this year from last—except for tubular goods.

The trend to cut tubular-goods inventories is not new. It started last year when the steel supply began to catch up with demand. At the same time the industry's drilling program was cut back. Oil-country steel supplies changed from a sellers' market to a buyers' market (OGJ, Aug. 12, 1957, p. 67).

In 1957, total shipments of steel products for the oil and gas industry set a record of 6,493,750 tons. This was nearly a million tons greater than the previous record year in 1956. In terms of tubular goods, the steel industry produced a record 2,822,853 tons in 1957.

One West Coast oil company said last week it had cut its purchases 50 to 75 per cent below normal and will continue to cut until present large inventories are depleted. The company said that normally tubular-goods orders are placed two or three quarters ahead of needs. Now that tubular goods are available for practically immediate delivery, the policy is to order only 30 or 60 days in advance.

Several producing companies in Texas say their purchases have dropped sharply. One reported a 15 per cent cut so far this year, most of it in tubular goods. Another estimated "conservatively" that purchases are down 20 to 25 per cent. Both are using up inventories.

One Texas executive feels the oil industry will continue to carry less inventory now that materials are easier to get and supply companies are better equipped to serve their customers.

In Oklahoma one purchasing agent pointed to present cutbacks in inventories as a probable factor in the 4-day work week which went into effect at some eastern steel mills

several months ago. He describes the situation as only "an inventory depression."

One big Tulsa-based company summed up the trend by saying its buying is fairly normal, except for tubular goods, "and everybody is cutting down on tubular-goods inventories."

Manufacturers' outlook . . . Some manufacturers of oil-field equipment are complaining that company budgets are lower, that manufacturers' inventories are growing, and that this dictates layoffs or shorter work weeks.

One manufacturer in the Mid-Continent area, which planned to shorten the work week for 100 plant employes "for the first time in 17 years," blames the cutback on "the slowdown in the industry." The company is hopeful that the regular 5-day schedule could be reinstated within a few weeks.

Another Mid-Continent manufacturer has been trying to decide which course to take for its 180 workers—whether to work 4 days a week or lay off some employes.

A Texas plant laid off about 8 or 9 per cent of its force during the fourth quarter of 1957. The company's automobile fleet was also reduced. However, most of the layoffs were in the sales force, and no further cuts are anticipated.

Instead, said a company official, "we're trying not to hire any more people. We could actually shrink some more but we don't want to tear up our organization." He thinks the worst of the cutback was in January.

Another Texas plant reduced the work schedule for some employes in January to 35 hours per week. But in February many of these workers went back to the normal schedule as the work load was gradually built up again.

A labor-union official said that some manufacturers have had heavy inventories for some time but kept hoping sales would increase. When they didn't the situation began "to force their hand" and talk of layoffs and shorter work weeks set in.

In several cases, manufacturers are taking this opportunity to trim dead weight and reduce inventories. They have found they can operate more efficiently—and more economically—with fewer men.

Reduction of the work week doesn't always involve firing. Sometimes the companies just fail to replace those who leave the company.

Reluctance to part with skilled workers is a good indication that management wants to be ready to meet increased demand when it comes.

Gas Bill Depends on Ike

. . . Industry hopes for all-out endorsement by president to offset Porter incident. FPC renews plea for changes.

INDUSTRY LEADERS are still confident that White House support can put the Harris gas bill through Congress. But they admit that nothing less than all-out support for the objectives of the measure is likely to influence a scared Congress.

The Harris bill, scheduled to be taken up in the House this week, has been held up. It may come up next month if congressional leaders feel that the heat generated by the recent Porter incident has cooled off sufficiently to permit Republican congressmen to reappraise their situation.

Chances of passage of the bill were hurt when H. J. (Jack) Porter, Houston independent producer and Texas Republican committeeman, sent out invitations to a $100-a-plate "appreciation" dinner tendered Rep. Joseph W. Martin of Massachusetts, House minority leader (OGJ, Feb. 17, p. 66).

Curse of the Porter letter was the assumption that Martin would put the Republicans on the spot to vote against the political demands of their constituents.

The Porter letter has been fervently disavowed by industry leaders, but opponents of the bill are making much of the fact that this was the second time in which individuals in the oil industry misplayed their hand. They are recalling the Case "incident" which led to veto of the measure 2 years ago.

The veto was a rebuke to the tactics followed in the offer of a campaign contribution to Sen. Francis Case of South Dakota, rather than objection to the aims of the bill. President Eisenhower said at the time—and has since repeated—that he supported the idea of relieving gas producers from federal control.

New pressure is being brought on the White House for formal support of the current measure. The fate of the bill may depend on the outcome of that effort.

Many believe that outspoken support may influence Republican congressmen who feel that they were put on the spot by Porter's letter.

Without White House backing, however, it is felt that the bill has only a slight chance of getting through the House.

FPC renews plan . . . The Federal Power Commission, meanwhile, again renewed its recommendations to relieve independent producers. It listed a number of amendments to the Natural Gas Act in its annual report. The report, written long before the latest developments in the political picture, was not aimed at the situation created by the Porter letter.

Regulation of producers continues to obscure its activity in other important areas, the FPC reported. Many major problems remain unsettled and the FPC work load continues to rise, the report said.

Nearly 6,500 rate increases, totaling over $96 million a year, have been filed by independent gas producers in 3½ years of regulation under the Supreme Court decision in the Phillips case, commission figures show. Certificate applications filed to that period exceeded 9,000.

A score of changes in the law was recommended by the FPC in its annual report. Here are some of the more important suggestions:

. . . **Dropping of certificates** for producers.

. . . **A standard for pricing gas** as a commodity which would not require use of a rate base or traditional utility rate-making principles "but would enable the commission to weigh the interests of the consumer in low prices with the necessity of providing assurance of future gas supplies."

. . . **Dropping mandatory requirements** for determining and considering costs of or revenues from other products, including oil and liquid hydrocarbons, sometimes obtained in conjunction with gas.

. . . **Equal treatment** for independent producers and pipeline producers with respect to pricing.

. . . **Elimination** of spiral escalation and favored-nation clauses in producers' sales contracts with interstate pipelines.

. . . **Revisions** to make Section 4 of the Natural Gas Act available to companies seeking to change filed contract rates to which the purchaser has not agreed.

. . . **FPC authority** to suspend rate schedules covering sales of natural gas for industrial use.

. . . **Authority for the FPC** to prescribe safety regulations for interstate pipelines.

. . . **Extension of FPC authority** to imports and exports of natural gas.

Journal Completes New Headquarters

THIS ISSUE of The Oil and Gas Journal was edited and printed in the just-finished building above.

The structure incorporates our remodeled "old" building with new construction to increase total space by 80 per cent.

The integrated building contains 47,200 sq. ft. of floor space. Editorial, advertising, circulation, and business offices are on the upper floor, with virtually all of the lower floor devoted to mechanical operations.

As the building neared completion, new presses and a new cover machine were installed (photos) to further speed production and improve quality of printing.

The new facilities will make possible faster printing, greater use of color, and other improvements in service to the reader.

New construction and new facilities were made necessary by the fact as the oil industry grows, so does the Journal. Circulation of the Journal is still increasing. And the Journal is now printing more pages of advertising and editorial material than any other magazine in the world. In fact, it has now completed 9 years as the undisputed leader in the volume of advertising sold.

Move into the new quarters marks the sixth expansion for the 56 year-old Journal since its headquarters were transferred to Tulsa in 1910.

The Journal was founded in Beaumont in 1902—just a year after Spindletop blew in—was moved to St. Louis briefly, and then established itself in Tulsa when it was only 8 years old.

The end of its expansion isn't yet in sight. Foundations were poured for the new building which will permit addition of another floor.

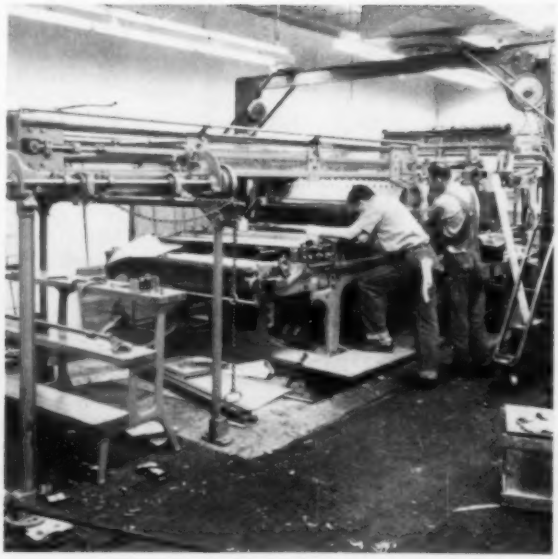
The doors are open every day to oil men interested in seeing how the world's biggest magazine is produced.

EDITORIAL STAFF of the Journal—bigger than that of any other industrial magazine—as it convened in the new conference room. Photo shows a panel discussion during the Journal's annual editorial conference. Present are more than 40 editors with a combined oil and publishing experience of more than 600 years.

NEWS CENTER (above) is in a remodeled wing of the "old" Journal Building. News developments throughout the world are funneled into this office to be converted into news pages of the next issue of the magazine. At desk in the foreground are News Editor Ted Armstrong, standing, and Assistant News Editor Carl J. Lawrence. In background are district editors Sara Bangert, Howard Wilson, and Robert B. Bizal.

NEW LOBBY and reception room (right). At left is Receptionist Leona McCauley and at right, Reader Service Clerk Mary Paul.

NEW EQUIPMENT for better printing (below) includes a $55,000 machine (left) which "stitches" the magazine, puts on its cover, and trims its rough edges. At right is one of two new $80,000 presses. Nine presses are used on a 24-hour, 5-day basis to print the Journal.



HEATED BIRD HOUSE contains a heating element controlled by a thermostat to keep temperatures constantly at 70° F.

ELECTRICITY needed to heat the house is metered. This measures actual heating values and reflects changes made on inside heat by sun, clouds, wind, and rain. When this data is correlated in computer with known weather factors, it shows how . . .

Esso Seeks A New Weather Yardstick

The goal is more effective degree-days information which reflects all weather factors. Result: A valuable tool for marketers, refiners.

RESEARCHERS at Esso Research & Engineering Co. are now trying to determine how the weather outside affects conditions inside a home.

They hope the result will be a more precise method of predicting and estimating heating-oil consumption.

This would be a boon to the refiner and distributor alike. Here's why: Heating oil is the industry's No. 2 product by volume. It also has the most variable demand of the major products.

Esso's concern is that the present degree-day system of determining how much heating oil will be needed is not sensitive enough.

What is degree days? . . . The present system of measuring weather conditions makes one big assumption:

No heat is needed in a home when the outside temperature is 65° or above.

Degree days is figured by averaging the high and low temperatures of a given day. The result is subtracted from 65°. This gives the degree days.

Thus, if the high temperature of the day is 50° and the low 40°, that particular 24-hour period equals 20 degree days.

But several important factors are ignored. No compensation is made for intensity of cold. The day may have had 20 hours and 40° weather and only 4 hours of 50° temperatures or 50° for 18 hours and 40° for 6. The result would be the same degree days in each case.

Other factors, such as rain, sunshine, and wind, also are not considered. A home may be much colder on a windy, overcast day than on a calm, sunny day even though the outside temperatures are the same.

The answer . . . Esso's approach is a device that will give more effective degree days.

It is a miniature, tightly insulated box. It is installed on a pole—like a bird house—atop the plant of a company reseller in Montclair, N. J.

Inside the bird house are a thermostat and an electric heating element. The thermostat maintains the inside temperature at 70° F. Any outside conditions, such as rain, sun, heat, and cold, that affect the temperature inside the house likewise affect its heating requirements. The amount of current used in heating the house is metered. Thus it relates directly to severity of the weather and gives effective degree days.

Work now is under way to correlate this data on effective degree days with the daily weather reports. From this study the importance of sunshine, clouds, wind, rain, etc., can be obtained and effective degree days calculated by fuel-oil suppliers.

The system would work like this: Information from weather-bureau reports could be fed directly into an electronic computer which already contains data from the company's studies. The figures when combined would reveal effective degree days.

Other possibilities also are available. The degree days could be obtained for every city in a heating-oil supplier's marketing area. Each home supplied with heating oil could be merely a mark on the electronic memory section of the computer. This means that each fuel delivery could be recorded and analyzed in connection with current weather conditions and individual heating habits. The computer then could determine just when and how much oil should be delivered.

Its value . . . Degree days are an important tool for the fuel-oil supplier.

They permit him to anticipate customers' needs and schedule deliveries.

With more effective degree days, the supplier would be able to fill a customer's tank when it is nearly empty. It's more economical to fill a nearly empty tank because over a season's business this policy alone will save two deliveries.

That's why Esso researchers hope their heated bird house may come up with answers that could save the industry thousands of dollars through more efficient operations.

Kenai Test Halted

at 12,046 ft. Rig moving to southern end of peninsula.

RICHFIELD OIL CORP. has suspended operations at 12,046 ft. on 2 Swanson River Unit in the Kenai National Moose Range, Alaska. The rig was being moved to the Deep Creek Unit on the southern Kenai Peninsula.

The explanation given was that 2 Swanson River Unit had gone as far as it could without additional geophysical work.

The whole subject of drilling operations in national wildlife preserves is currently being hashed out between oil companies and the Department of Interior. Permits for geophysical work are being held up pending settlement on new rules for game areas.

Drilling on holdings of Richfield and Standard Oil Co. of California, Western Operations, Inc., will now come under operational control of Standard-Western under an agreement signed last year between the two companies. The Deep Creek unit is outside the Kenai Moose Range and the necessary geophysical work there has been completed. No drill site has been announced, however.

The Coastal Drilling Co. rig being used will probably be moved back on the 2 Swanson River Unit test after completing the first Deep Creek test, a Standard-Western spokesman said.

USGS Gets Hot-Oil Job

ENFORCEMENT of the Connally Hot Oil Act will lie hereafter in the Geological Survey.

An executive order by President Eisenhower paved the way for transfer of the job from Interior's oil and gas office. The switch was part of a plan of Sec. Fred A. Seaton to bring the oil and gas office into line as a part of his own office.

His first step in that direction was to request the resignation last month of Director Hugh A. Stewart. His second was to secure the listing of Stewart's job as a political rather than a Civil Service post.

Processing briefs

Texas Natural Gasoline Corp. and Tennessee Gas Transmission Co. will begin construction in April on a $3,000,000 natural-gasoline plant 15 miles southeast of New Orleans. The new plant will have capacity of 150,000 M.c.f. daily. Fluor Corp., Ltd., will build the plant. Completion is scheduled in November.

Jefferson Lake Sulphur Co.'s proposed sulfur plant east of Calgary will be operated by a new Canadian subsidiary called Jefferson Lake Petro-Chemical Co., Ltd. Negotiations are now under way for public financing of the subsidiary. Jefferson Lake recently found sulfurous gas for the fourth time in as many tries on an 80,000-acre farmout from Mobil Oil of Canada, Ltd. The company says it expects to complete financial arrangements for plant construction within 60 days.

Gulf Oil Corp. will build a new 2,000-bbl. alkylation plant at its 42,000-bbl. refinery at Toledo, Ohio. Sulfuric acid will be used as a catalyst. M. W. Kellogg Co., contractor, will start work on the new unit this summer. Completion is scheduled some time in 1959. The new unit at Toledo will be Gulf's fifth alkylation plant.

Esso Standard Oil Co.'s new supertanker, the 35,500-ton Esso Chile, set a record on its maiden voyage. It unloaded 233,000 bbl. of bunker C at Esso's Bayway refinery in 13¾ hours. Average time is 22 hours. The Esso Chile hit a top rate of 20,000 bbl. per hour, 8,000 above the previous record. Its cargo was also the largest ever delivered to Bayway.

New chairman of Wilshire Oil Co. of California is Edwin Singer, president of Pontiac Refining Corp., Corpus Christi, Tex. Wilshire was recently acquired by Pontiac Western Corp., a subsidiary of Pontiac Refining (OGJ, Feb. 17, p. 76). E. J. Coopman, San Mateo, Calif., land developer and gasoline dealer, is the new president and chief executive officer of Wilshire.

Earl Allen, formerly vice president of the firm, has been named executive vice president. Wilshire operates a 30,000-bbl. refinery at Norwalk, Calif. Products are distributed through nearly 500 service stations. Robert O. Anderson, former Wilshire president, will remain on the board.

Esso Standard Oil Co. has completed construction of a 7,200-bbl. Powerforming unit at its 50,000-bbl. Everett, Mass., refinery. The new unit, built by Badger Manufacturing Co., had to be placed on stilts because of the marshy tidelands in the area. Esso now has a total of three Powerformers, with one under construction.

Gulf Oil Corp. has denied reports that it plans to shut down its 282,000-bbl. refinery at Port Arthur, Tex., by May. The company said the refinery's 120,000-bbl. distillation unit will be down for repairs during the entire month of May, but pointed out that this is in keeping with normal practice. The unit will be back in operation early in June.

Gulf said that runs have been reduced by about 8 per cent at the Port Arthur plant because demand has not increased as expected. The present reduction and the forthcoming overhaul will not mean a reduction in work force, the company said.

The use, treatment, and disposal of chemical wastes from refineries is featured in the latest American Petroleum Institute publication. The new edition, entitled Volume III, Chemical Wastes, of the Manual on Disposal of Refinery Wastes, also carries a summary on the sources of chemical wastes and methods of control.

Also for Refiners . . .

IN THE NEWS: Russia's refining and production centers have changed radically since prerevolution days (p. 100) . . . Netherlands refinery to get first Nigerian crude (p. 101) . . . BP's Kent refinery puts an 80,000-bbl. crude unit on stream (p. 101) . . . Pontiac Eastern dedicates new refinery at Hattiesburg, Miss. (p. 98) . . . LPG stocks fall to last year's midwinter level (p. 98) . . . Industry is cutting back production and refinery runs trying to cure its surplus (p. 81) . . . Pressure for quotas may force Government to change import policy next month (p. 84) . . . Esso seeks a weather yardstick to estimate home heating-oil consumption (p. 90) . . . Four firms favor Karachi for refinery site (p. 104).

PLUS THESE TECHNICAL REPORTS: Evaluating crude in refining operations (p. 125) . . . A low-cost alky-system depropanizer (p. 139).

Colorado Oil Tax Upheld

. . . in district court test by Calco. Judge says production is local, not interstate, activity. Appeal is expected.

COLORADO'S gross income tax on oil and gas production is legal and proper.

Denver Dist. Judge Edward J. Keating upheld the constitutionality of the so-called severance tax in a lawsuit filed in 1955 by The California Co., largest producer in Colorado and major operator in the state's huge Rangely field.

In addition, the judge granted a counterclaim by the state and directed Calco to make a full accounting showing whether it has paid what it owes under the tax.

Calco brought the action against the state for a refund of $1 million paid under protest on its production for the year 1953.

The income tax law imposes a maximum levy of 5 per cent on gross income over $300,000 derived from oil and gas production. The rate is graduated downward from that level to a minimum of 2 per cent on the first $25,000. All Colorado producers have paid in about $15 million since the tax was enacted in 1953.

Company overruled . . . In fighting the law, Calco contended that the tax denied equal protection under the law, was discriminatory, was improperly drawn, was an unreasonable burden on interstate commerce, and could not be collected because most of Colorado's oil comes from federal lands.

Judge Keating overruled the company on each point and found specifically that the amount of the tax represents only a fair share of the cost of state government borne by the oil industry.

The judge said: "Our lawmakers had good and valid reason in the public interest in fixing the graduated rates applicable to gross income derived from the production of oil and gas."

He cited Rangely field operations in refusing to accept Calco's argument that the oil it extracts from the ground is in a continuous flow of interstate commerce from the bottom of the well to the far end of the pipeline.

"The oil comes from beneath the ground to the wellhead," Keating said. "It then flows into a separator where it is processed; next it flows into a heater-treater and is again processed; it then flows into temporary storage where it is measured.

"When oil leaves the tanks, title to it passes to the purchaser, and the oil at that point enters and is transported through an interstate pipeline.

"The oil is twice processed and is stored after it is produced and before it enters interstate commerce. Colorado has a right to tax the gross income derived from this local activity within the State of Colorado."

Refund issue . . . In ordering an accounting of Calco's income-tax returns, the judge said the company claimed a refund of $122,000 as an operating expense and then used the same amount again as a deduction in determining gross profits.

The company "cannot have its cake and eat it too," Judge Keating said.

In order to get a quick final settlement of the test case, Keating dispensed with motions for a new trial and urged that Calco—if it wants to appeal—take the case to the Colorado Supreme Court as soon as possible without waiting for the accounting.

Calco's principal attorney, Virgil Cline, indicated the appeal would follow.

New Gas Contract

made by Transwestern for deliveries to West Coast.

PACIFIC LIGHTING Gas Supply Co. signed an agreement with Transwestern Pipeline Co., Houston, for purchase by Pacific Lighting of 350,000 M.c.f. daily of natural gas starting late next year.

The contract has features which could boost the ultimate purchases by Pacific Lighting from Transwestern to 640,000 M.c.f. daily.

The deal calls for delivery of the West Texas-New Mexico gas to Pacific Lighting at a point near Needles, Calif., on the California-Arizona border. To do this, Transwestern plans to start work on a 30-in. pipeline to California this fall. Cost of the pipeline is reported at $200 million.

The project will make Transwestern a competitor with El Paso Natural Gas Co. in supplying natural gas to California. Heretofore, this market has been El Paso's exclusive property.

The Transwestern-Pacific Lighting deal must get the approval of the Federal Power Commission and the California Public Utilities Commission.

Transwestern is owned by Monterey Oil Co., Warren Petroleum Corp., and J. R. Butler and associates, Houston.

Pacific Lighting Gas Supply Co. supplies Southern California Gas Co. and Southern Counties Gas Co. with natural gas. All three are wholly owned subsidiaries of Pacific Lighting Corp., Los Angeles. Southern California Gas and Southern Counties last year put into operation a 30-in. line from Needles to Los Angeles.

Pecos Wildcat

whipstocked at 19,900 ft. after fish job fails.

PHILLIPS PETROLEUM Co.'s 1-EE University in West Texas, a contender for the title of world's deepest hole, became the world's deepest whipstocked hole last week.

The company, dogged by stuck drill pipe at the deep Pecos County wildcat turned to whipstocking below 19,000 ft. after 7 weeks of trying to recover fish at 21,397 ft.

The wildcat, which has been under way since October 1956, is scheduled to go to 23,000 ft. in search of Ellenburger pay. Top of the fish is at 19,986 ft.

The 1-EE University, one of five Phillips tests now drilling in Pecos County, is just 7 miles northwest of the world's second deepest hole, Pan American Petroleum Corp.'s 1-CS University, which was abandoned last December at 21,687 ft., after drill pipe parted.

The Pan Am well is the deepest in Texas and just 883 ft. shallower than the world's deepest, which was drilled to 22,570 ft. in South Louisiana by Richardson & Bass and others.

Besides the 1-EE University, Phillips has four other wildcats under way in the same area:

. . . 1-A Montgomery, about 30 miles southwest of the 1-EE University, is drilling below 16,669 ft. in the Wolfcamp. The Montgomery, which is owned one-third by Sinclair Oil & Gas Co., is scheduled to go to 22,000 ft. Nine and five-eighths inch casing has been set to 15,868 ft.

. . . 1-A Harral, about 11 miles southeast of the 1-EE University, is at 15,853 ft. with stuck drill pipe. The well is scheduled to 18,000 ft.

. . . 1-B Harral, which is southeast of the 1-A Harral and about 15 miles east of Puckett field, is drilling below 13,752 ft.

. . . 1-C Harral, about a mile northwest of the 1-B Harral, was spudded last week.

CATC Hits in Gulf

at record water depth of 137 ft. in three pay zones.

A WILDCAT drilled as a tight hole in the deepest water yet tested in the Gulf of Mexico has been completed as a triple-zone producer.

The discovery, in a record 137 ft. of water, is the CATC Group's No. 1 in Block 70, West Delta area. It is about 23 miles off Grande Isle, La.

Drilled to 13,495 ft., the well produced oil at the rate of 443 bbl. daily from two zones, plus an ungaged amount of oil from a third interval.

From perforations at 8,356-72 ft. the well flowed at the daily rate of 253 bbl. of 32°-gravity oil through 8/64-in. choke. Through the same size choke it flowed at the daily rate of 190 bbl. of 28.1°-gravity oil from perforations at 8,414-22 ft.

From perforations at 9,240-54 ft. the well produced 75 per cent oil and 24 per cent water through 12/64-in. choke. Flow of oil from this interval was not gaged, according to the operator.

The discovery, about 4 miles from nearest production in Grand Isle Block 43, is in the 28,000-acre West Delta-Grand Isle federal unit. The tract adjoins a 52,000-acre Grand Isle unit which is also held by CATC.

Gas Export Policy

studied by Canadian group. Big reserves estimate made.

CANADA can expect an interim report soon on gas exports from the Borden Commission on Energy.

The commission conducted hearings at Calgary last week and received extensive testimony on current and long-range plans of pipeline companies to move gas into the United States.

Chairman Henry Borden told the hearings he wants suggestions on an export policy because the commission may soon issue an interim report on the subject.

The Canadian Petroleum Association told the commission that Canada's estimated reserves amount to 50 billion barrels of oil and 300 trillion cubic feet of natural gas.

The association's figures far exceed those made by the Petroleum and Natural Gas Board for Alberta, whose estimate runs to only 15 billion barrels of oil and 60 to 80 trillion feet of gas. However, board's estimate is based on presently known reserves, while the CPA's estimate takes into full account the extent and depth of western Canada's sedimentary basin.

Pipeline briefs

Interprovincial Pipe Line Co. has awarded a contract to Piggott Construction, Ltd., Pipeline Division, Edmonton, to build 82 miles of 24-in. loops along its crude system in Alberta and Saskatchewan. The loops to be laid from June 1 to September 1, are in four sections starting from stations at Edmonton and Hardisty, Alta., and Kerrobert and Loreburn, Sask. They will complete a double line on the Edmonton-Superior, Wis., section of the line, which extends eastward to Toronto.

Canadian manufacturers are supplying most of the materials for the expansion. Welland Tubes, Ltd., is making the pipe; engines and speed increasers for the 2,040-hp. diesel pumping units at Regina and Gleavon, Sask., and Cromer and Glenboro, Man., will be supplied by Dominion Engineering, Ltd.; and pumps will come from Bingham Pump Co.

Alberta Gas Trunk Line Co., Ltd., last week received bids on its 1958 construction program involving 64 miles of 34-in. from a point 15 miles south of Bindloss to Denhart and 149 miles of 24-in. from Denhart to Pincher Creek field. The new line will connect Sibbald, Oyen, Cessford-Sunnybrook, Princess-Patricia, Atlee-Buffalo, and Pincher Creek to the system which supplies Trans-Canada Pipe Lines, Ltd. This is the second of four stages which will be completed to boost Alberta Gas Trunk Line deliverability to 620,000 M.c.f. daily.

Service Pipe Line Co. plans to modernize the Casper-Fort Laramie section of its main line from Wyoming to Chicago by replacing a 12-in. line with 75 miles of 20-in. Construction is planned for this summer. The new 20-in. section, plus three new remotely operated pump stations in Wyoming and Kansas and expansion at several other stations, will give Service sufficient capacity to handle crude volumes expected this year.

Canadian labor unions have again accused U. S. pipeline construction firms in Canada of discriminating against native skilled and common labor. They have asked the government to bar Americans from jobs on Trans-Canada Pipe Lines, Ltd., in Manitoba and Ontario, as a means of easing Canada's near-record unemployment.

Pipeline contractors explain that virtually all common labor on Trans-Canada is Canadian, and that jobs are available for qualified Canadians during the construction season. Contractors with U. S. subsidiaries, while not required to do so, make a practice of hiring all local labor possible as a public-relations gesture. They have been plagued by high turnover ranging up to 400 per cent in less than 6 months, a situation which balloons construction costs.

Work will start about mid-March on expansion of Continental Pipe Line Co.'s 230-mile crude-oil system between Lance Creek, Wyo., and Denver. Oil Capital Construction Co., Tulsa, has been awarded contract for the job, which will cost an estimated $430,000.

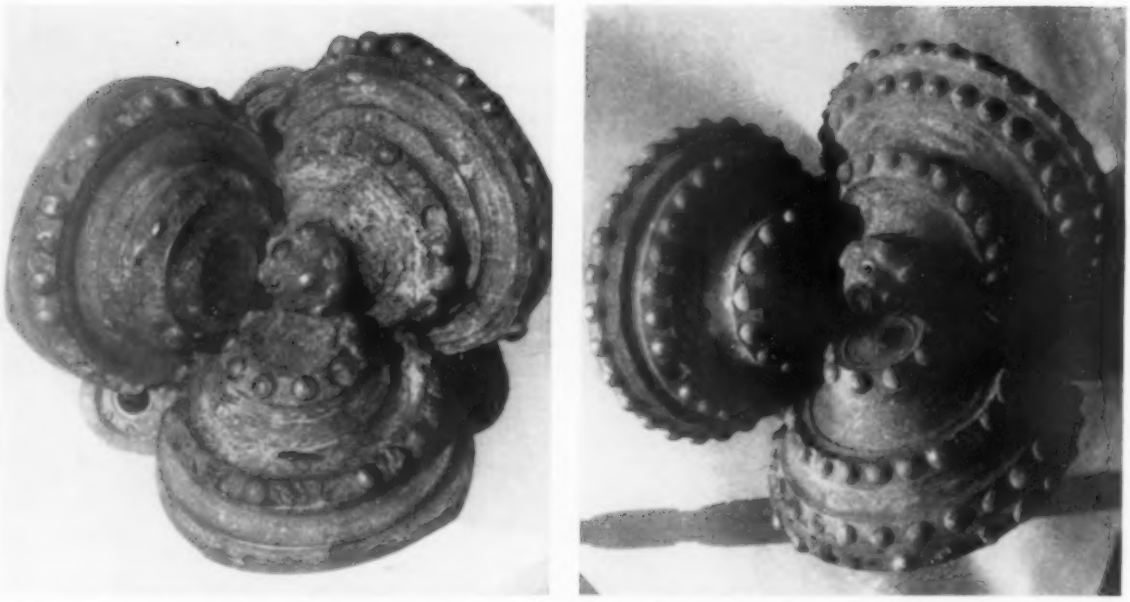
The project will include three new pump stations in Wyoming and new delivery facilities at Cheyenne. When the expansion is completed the line will have a capacity of 46,000 bbl. daily between Guernsey, Wyo., and Cheyenne and 34,000 bbl. from Cheyenne to Denver.

The Interstate Commerce Commission has set up a 45-man committee to assist in determining value of pipelines. The committee, selected from names submitted by crude and products-pipeline companies, takes over much work heretofore done for ICC by men sent to Washington by companies. The committee will be headed by a government chairman, Howard L. Domingus, acting chief of valuation, meeting rules laid down by the Justice Department for business advisory groups.

Also for Pipeliners . . .

IN THE NEWS: The business lull has caused oil men to buy less tubular goods and use their inventories (p. 86) . . . There's still hope for the Harris gas bill—if Ike will push it (p. 87) . . . Transwestern signs California agreement to supply an area formerly served exclusively by El Paso Natural (p. 92) . . . Kerr-McGee defends its policy of making producers pay for gathering costs (p. 82) . . . Borden Commission may issue an interim report on Canadian gas export policy (p. 93).

PLUS THESE TECHNICAL REPORTS: NPSH and centrifugal pumps for pipelines (p. 121) . . . Two meter proving methods (p. 153).



LONGER LIFE for the rock bit at the left resulted from lubrication of the bearings. Bit on the right still has more teeth, but it penetrated far less because bearings locked before cutting potential was half used.

Mud Additive Extends Life of Drill Bit

GULF OIL CORP. believes it has developed a drilling mud that will cut drilling time by 12½ to 25 per cent.

Drill bits which use a new lubricating additive should last from two to five times as long as before. The claim is based on research and field trials.

Gulf points out that in a large number of drilling operations, the bearings on the drill bit fail before the teeth. If the drilling mud can lubricate the bearings, then the reverse will be true. And this is what Gulf says it has done.

To support its claim, Gulf says its production engineering scientists tested the new additive with a machine which determines the load-carrying characteristics of extreme pressure (E.P.) lubricating oils.

"Some 3,600 test runs of mud formulations were made on this machine, with results exceeding the expectations of the researchers," Gulf says. "Conventional oil emulsion mud showed only minor lubricating quality on the machine; but when E.P. additives were introduced, the load-carrying characteristics of the resulting mud mixture rose to surprisingly high values."

The pilot tests . . . Gulf next ran pilot tests on a full-scale drilling rig at the company's research center. Commercial bits were used to bore into steel blocks flooded with mud under test. The result: Bits lubricated with the new additive lasted two to five times longer.

Bits which ran with conventional muds averaged 18 bit-life hours before failure. Those with E.P. additives averaged 55 hours.

Here are results of some specific pilot tests: Conventional oil emulsion mud, 20 bit-life hours, E.P. additive, 60 hours; conventional 6 per cent Bentonite mud, 10 hours, E.P. additive, 55 hours; conventional clay and water, 15 hours, E.P. additive, 65 hours; conventional weighted mud (11.5 lb./gal.), 38 hours, E.P. additive, 78 hours.

The field tests . . . Gulf made its field trial tests in West Texas.

In one test, a bit with conventional mud ran 17¾ hours and made 344 ft. before failure. In a similar formation nearby the same type bit with the same mud—but with E.P. additives—ran 41 hours and made 915 ft.

Other West Texas tests, in harder formations with tungsten carbide insert bits, gave results even more startling. With conventional muds, "locking" of the cones occurred within 15 to 50 hours, with an average of about 25 hours. With E.P. muds the average bit life was about 100 hours. One bit drilled 1,200 ft. in a hard dolomite formation.

After the E.P. runs, the testing operators found that bearings were still good after the cones had been "literally beaten smooth with teeth ground down until hardly a cutting surface remained."

"Usually it has been impossible to subject teeth to such wear because of early bearing failure," Gulf pointed out.

Other advantages . . . By extending the life of drill bits, operators can hope to cut in half the number of round trips on deeper wells, Gulf says. This means, of course, less wear on drill pipe and the drilling rig.

Still another advantage is that the lubrication reduces friction throughout the hole and thereby cuts the power requirements for turning the drill string.

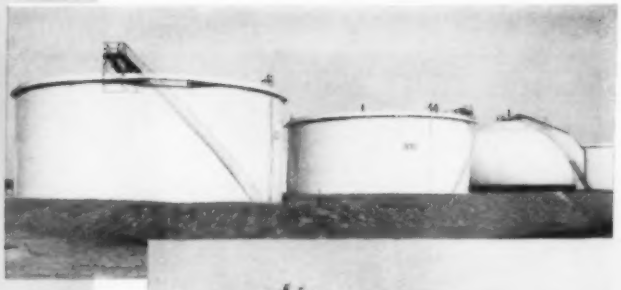
These benefits, Gulf claims, are even more pronounced in crooked and directional holes.

Drill pipe rotating torque measured on several test wells dropped as low as 1/20 of those using conventional muds, Gulf says.

Gulf plans to share the new additive with the industry by licensing mud service organizations to handle it.

77

CB&I **Structures serve as WORKING PARTNERS for American Oil Company Refinery**



Where there are refining operations there are sure to be welded steel storage and processing structures built by CB&I... *Working Partners* built to exacting specifications because they are backed by the expert and *coordinated* design, engineering, fabrication and erection services that are available from CB&I.

At American Oil Company's 35,000,000-bbl. per day Yorktown, Virginia, refinery 77 CB&I-fabricated structures play an important role. Reactor, regenerator, crude, vacuum and absorber towers and catalyst hoppers are teamed with 62 Horton storage tanks, Hortonspheres® and Hortonspheroids® to serve many phases of this modern, efficient refinery operation.

Yes, where there's refining—you'll find the experienced *craftsmanship in steel* that is CB&I. A new booklet describes CB&I FIELD SERVICES. Write our nearest office for a copy.

Top: Horton Pontoon Floating-Roof tanks, Hortonspheroids and Hortonspheres at Yorktown refinery.

Left: American Oil Company's modern orthoflow converter makes extensive use of CB&I-fabricated components. Equipment was furnished through M. W. Kellogg Company.

P60CB(R)

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ECONOMICAL deep-water drilling is the aim of this model as . . .

Shell Designs Circular Barge

A "FLOATING DOUGHNUT" is one of several vessels which Shell Oil Co. is experimenting with for drilling in deep water.

The company believes this design may be the "economic key" in the search for offshore oil where water depth is too great for fixed or mobile pile-type drilling platforms.

Shell is testing various designs for floating drill barges. The "doughnut," as shown above, is a circular vessel with a hole in the center for drilling.

B. H. Brown, of Shell's technical services division at Houston, is shown holding the upper section of the model. This deck would contain the helicopter landing deck, automatic pipe rack, draw works, derrick, and other drilling equipment.

Shown in front of B. G. Collipp, also of the Houston division, is the lower section of the doughnut. This would provide space for mud storage, pumps, power equipment, and living quarters. Around these facilities are bulkheads which may be used for other storage.

Shell revealed last week that a model of the doughnut is being tested at the University of California. A company announcement said it "appears to hold considerable promise for more successful deep-water drilling" because it is less vulnerable to wave action and is relatively cheap to build.

Floating barges have proved capable of core drilling in water as much as 1,500 ft. deep, but vessels used to date were originally designed for other purposes. Pile-type platforms now in use are limited to about 150 ft. of water, although very few are designed to operate in water more than 100 ft. deep.

—— *Industry* briefs

Carter Oil Co.'s research laboratories in Tulsa will be turned over to a new production research affiliate of Carter's parent company, Standard Oil Co. (N. J.). The new Jersey affiliate, to be known as Jersey Production Research Co., will continue Carter's exploration and production research activities for Jersey affiliates in the U. S. and abroad. The 400 staff members at the Tulsa lab will be transferred from the Carter staff to the new company.

Oil operators will save many hours of travel time when a road and bridge are completed in the remote Four Corners area of southeastern Utah. Bids for the 23-mile road will be let March 10. The much-needed highway will connect the Aneth producing area to Utah State Highway 47 south of Blanding.

The new bridge will span the San Juan River near its confluence with the Montezuma Creek between Aneth and Ratherford fields. Construction will begin by June 1. Both the Navajo Indian tribe and oil companies have contributed several hundred thousand dollars to help pay for the project.

Gov. Price Daniel's new Texas oil-imports commission will hear first witnesses February 25-26 in its investigation of the effects of crude imports on the Texas economy. French M. Robertson, Abilene independent operator and commission chairman, said the witnesses will represent "all walks of life" and that the probe "will not be a whitewash or favor any particular group."

Mission Development Co. stockholders have approved increasing the authorized stock from 5 to 6 million shares and exchanging the added 1 million shares for 437,034 shares of Tidewater Oil Co. This will raise Mission's ownership of Tidewater, now 47.37 per cent, up to more than 50 per cent.

Los Angeles will set up a new petroleum office to handle drilling activities on city-owned property and to set up drilling restrictions on private property in the city. William McCoy, assistant city administrative officer, will head the new office. He will have the assistance of a part-time oil expert. The move was made as drilling prospects picked up in some of the oldest oil-producing areas in the city.

Second Year for X2 Rods in 5030-ft Well in Colorado

Shown above is British-American Oil Producing Company's Mittelstadt B-1 Well in the Darby Creek Field, near Sterling, Colorado, in which a string of Bethlehem ¾-in. X2 Sucker Rods will soon be rounding out its second year of service.

Production from this well is in excess of 100 bpd. The Bethlehem pumping unit is a Series 114D-14A. It has a 54-in. stroke, and operates at 18 spm.

Bethlehem X2 Sucker Rods are forged from carbon-manganese steel, and are effectively normalized to provide uniform mechanical properties. They're the kind of rods you can count upon for economical performance in medium pumping duty, whether they are used in non-corrosive wells or in wells which are properly inhibited.

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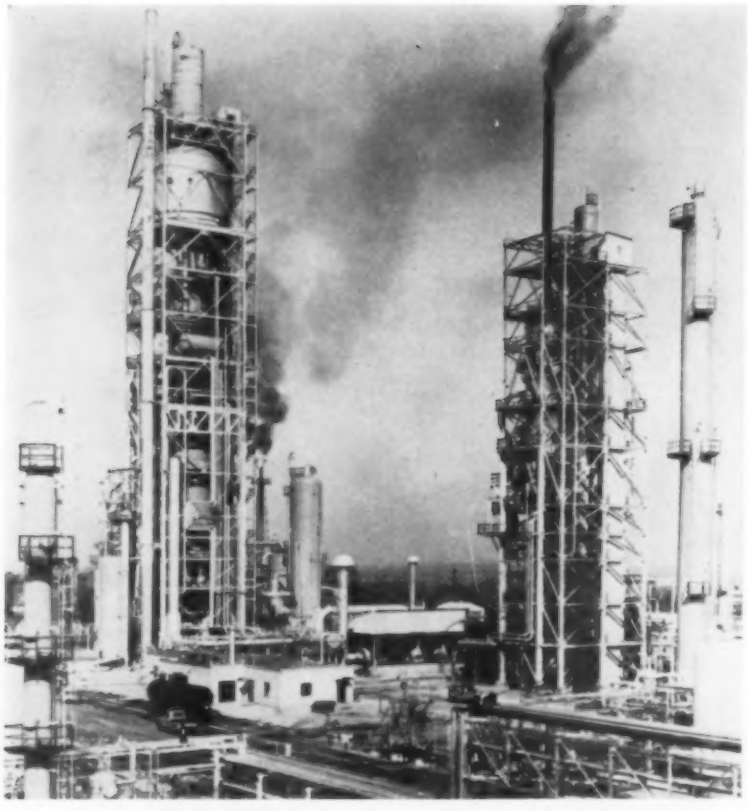

NEW REFINERY turns out gasoline without crude unit as . . .

Pontiac Solves Tough Problem

A NEW REFINERY that's a tribute to technological progress was formally dedicated last week about 12 miles from Hattiesburg, Miss.

The plant is the $20-million Black Creek refinery of Pontiac Eastern Corp. Its notable achievement: An output of 85 per cent of gasoline based on an input of 3,500 bbl. of field distillates and 11,000 bbl. viscous, 16°-gravity crude oil—a crude formerly suitable only for low-grade fuel oil and asphalt.

Processing the crude takes place without the basic crude distillation unit. Instead, the crude is flashed in a tar separator, then charged directly to a Thermofor catalytic cracking unit and a fluid coker. Distillates are handled on a segregated basis (OGJ, Mar. 18, 1957, p. 96 and October 21, 1957, p. 66).

Pontiac Eastern's parent company is Pontiac Refining Corp., Corpus Christi. Edwin Singer is president of both companies.

The plant is an outgrowth of Gulf Oil Corp.'s request for Pontiac to study the heavy Mississippi "problem" oils and find a way to produce prime motor fuels from them. The result was a technical solution, formation of Pontiac Eastern, and the new refinery.

Gulf, Mississippi's largest producer, will supply crude for the plant and market products in Mississippi and other southeastern states. Fluor Corp., Ltd., handled the engineering and construction of the plant.

Washington Slows Down

WASHINGTON is still a one-well oil state.

The first two efforts to extend production beyond Sunshine Mining Co.'s Ocean City discovery well, 1 Medina, have run into trouble.

The first extension, 2 Medina, gave early promise of being successful after good formation tests. But production failed to hold up, and it was being abandoned last week. The well is 1,500 ft. northwest of 1 Medina.

Sunshine Mining's second wildcat, 1 Minard, was a 5,032 ft. test at Duck Lake about 5 miles south of 1 Medina. The operator recently ran logs. No further testing is planned immediately.

LPG Stocks Fall

sharply to 1957 level after hitting all-time summer high.

LPG STOCKS, which shot up to a record high in September have dropped to about the same level as midwinter last year.

Colder than normal weather over most of February should push total stocks still lower, giving a good working base for spring and summer months and providing a firmer foundation for LPG markets this year.

The 1957 peak was reached in September when LPG and LRG inventories climbed to 1,016,510,000 gal. By the end of January, this was almost cut in half to 513,625,000 gal.

Heavy pull on inventories began early in the season when temperatures were below average over much of the nation. In contrast, last year's winter was warmer than average.

Inventories for each of the first 5 months of 1957 were more than double those for the corresponding months in 1956. From February 1956 through September 1957 there were only 3 months when LPG stocks were reduced — November and December 1956 and January 1957. Stocks climbed about 3,000,000 gal. in February last year.

Operators will start the spring season this year with more storage room than last year. Since underground storage came into use 7 years ago, the industry has made room for nearly 1,428,000,000 gal. of LPG.

The table below includes stocks of LRG at refineries as well as LPG at plants, terminals, and underground storage. Totals do not include propane injected into oil reservoirs in miscible-phase recovery projects.

TOTAL LPG AND LRG STOCKS

(Thousands of gallons)

	End of month stocks	Increase over previous year
1957—		
January	479,427	266,464
February	481,414	282,248
March	555,298	313,743
April	628,072	330,216
May	791,816	397,553
June	902,078	405,492
July	960,140	384,041
August	1,001,991	386,454
September	1,016,510	297,052
October	968,685	217,327
November	864,217	164,951
December	691,432	71,998
1958—		
January	513,625	34,198

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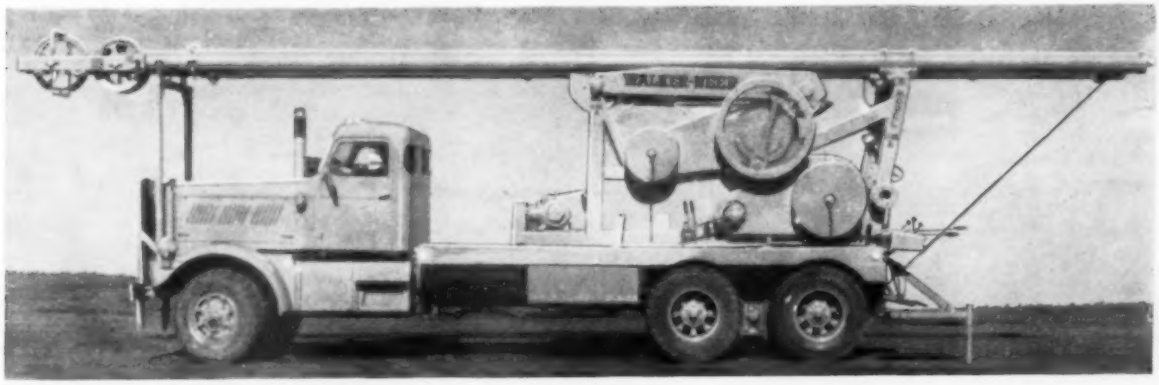

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The top drum is a heavy-duty drum designed to handle drill tools, swabbing, casing, and other heavy work, as well as for high-speed bailing. Drum shaft diameter is 4 11/16". Double brakes are 43" OD, 6¼" wide. The drum clutch is a 2-plate 24" heavy-duty air clutch—mounted in the drum end.

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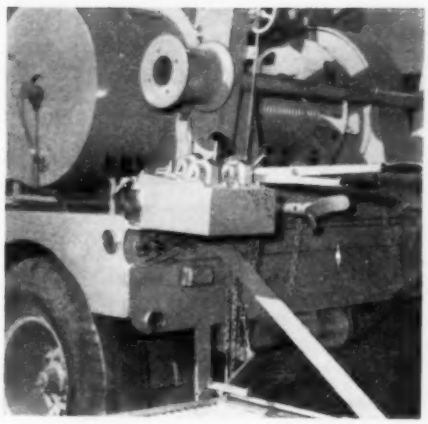

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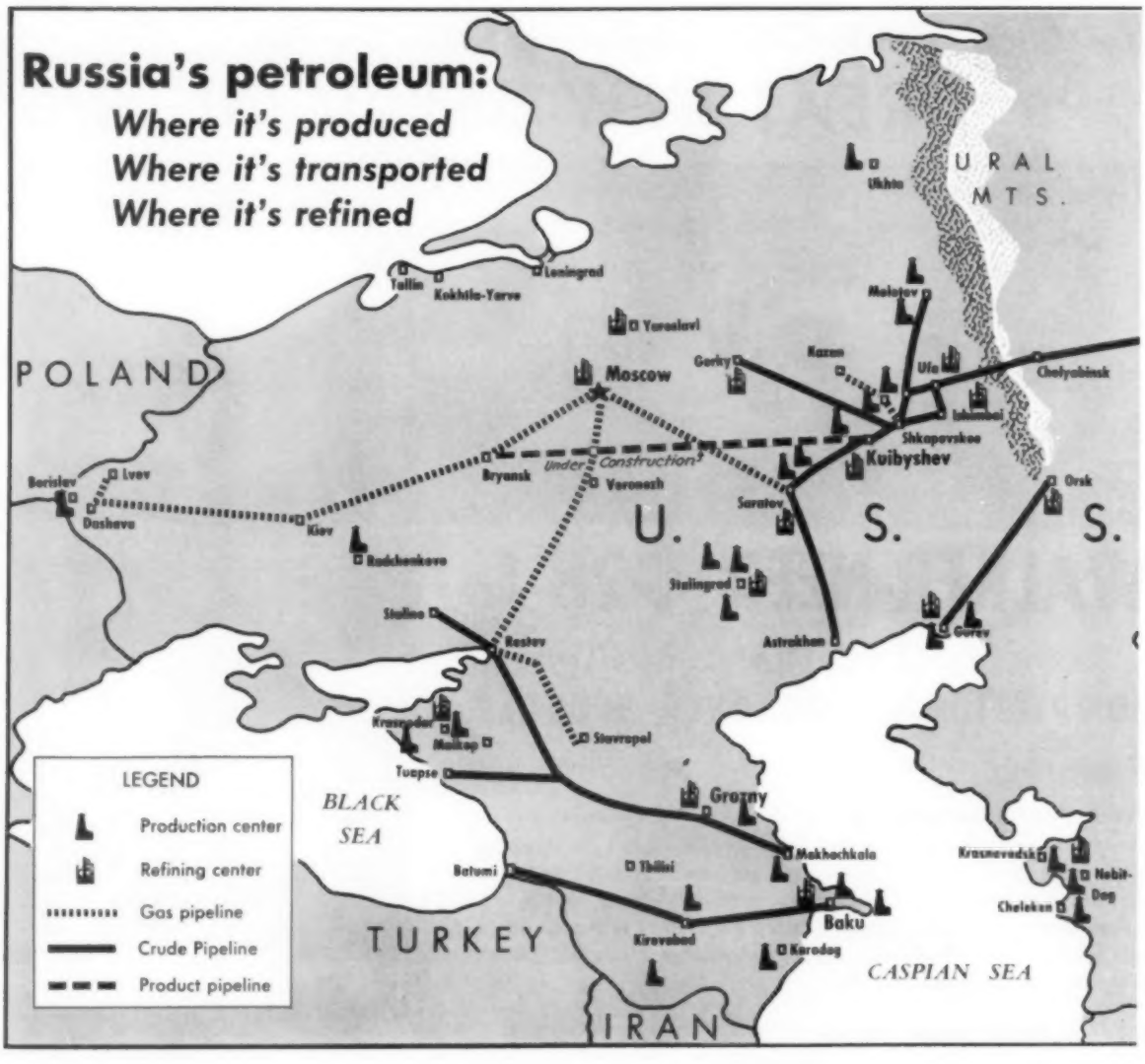


New Soviet Map Points to Big Changes

SOVIET RUSSIA has issued a new map on its oil industry.

The map shows the radical shift that has occurred since Tsarist days, when the principal production and refining centers were located in the Caucasus area around Baku and Grozny near the Caspian Sea.

Today the petroleum center of Russia is in the Volga-Ural area near Kuibyshev and Ufa, where 64 per cent of the nation's oil is produced.

The Soviet map commemorates the fortieth anniversary of the Bolshevik revolution and purports to show the production, refining, and distribution systems of the country—from the European border to the Pacific. Several pipelines and refineries that were omitted, have been added in order to give as complete a picture as possible of Russia's oil development.

The Soviets say their daily average production in 1956 was 1,680,000 bbl. and in 1957 was 2,008,000. This year's goal is 2,287,000, and for 1960 it's 2,700,000.

Communist Party Leader Nikita Krushchev predicted recently that in 15 years Russia would produce 7,000,000 to 8,000,000 (OGJ, Dec. 2, 1957, p. 77) and top that of the U.S.

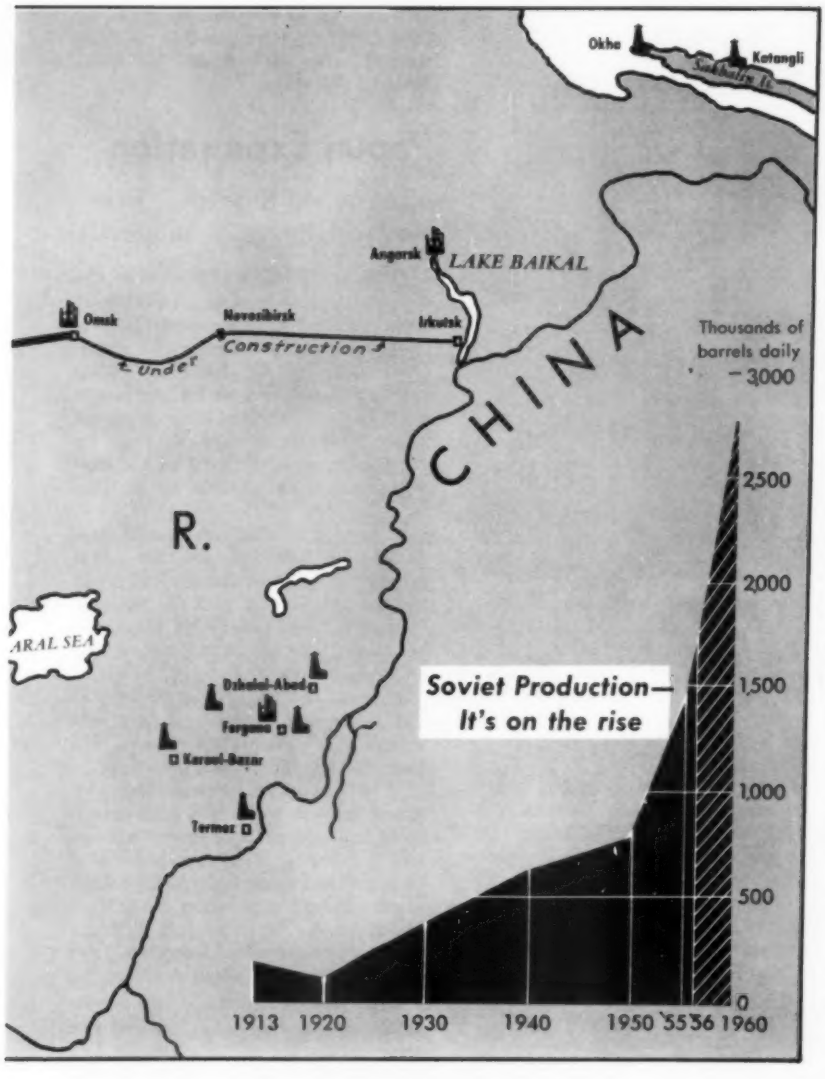
Russian figures show a gradual rise in production (from 76,000 bbl. per day in 1920) until 1950, when the trend shot upward swiftly.

In natural gas, the Soviets produced 713.3 billion cubic feet last year. They hope to top 1 trillion cubic feet this year, and Krushchev says he expects expansion of production by 13 to 15 times within the next 10 to 15 years.

The changes . . . In pre-revolution days of 1913, more than 97 per cent of Russian oil came from the Caucasus, compared with 2.9 per cent in Central Asia and Kazakhstan. The Volga-Ural area, now known as the "second Baku," produced no oil at all.

Today the Caucasus accounts for only 27 per cent of Soviet oil, Central Asia and Kazakhstan 8 per cent—and the Volga-Ural area 64 per cent.

The refining picture likewise has changed. The Caucasus, in 1913, had



in Producing, Refining

90 per cent of the refining. The Moscow central area had 7 per cent and other sections 3 per cent. The Volga-Ural region had none. But in 1955 the Caucasus refined only 37 per cent of Russian oil, the central area 5 per cent—and the Volga-Ural region 47 per cent. Other areas had 11 per cent.

Pipelining has come a long way, too. In 1933 only 2.4 per cent of Russian oil and oil products moved by pipeline—most of it between Baku and the Black Sea port of Batumi. By 1955, with production mostly in the Volga-Ural region, transportation economics dictated that 71 per cent of Russian crude move by pipeline. By the close of 1960 the Soviets hope this figure will increase to 84 per cent.

What's left out . . . The official new Russian map fails to show the recently-completed 350-mile crude pipeline from the Tatar Republic fields southeast of Kazan to Gorky and a 700-mile products line under construction from Kuibyshev westward to Bryansk. Both tap the "Second Baku" producing and refining areas.

Also missing from the Russian version are the newly-opened refinery at Stalingrad and two others being built at Angarsk, near Irkutsk in Siberia, and at Fergana in Ceneral Asia. Other omitted refineries, some of them small and obsolete, are located at Odessa, Tuapse, Batumi, Kherson, and Osipenka in the Black Sea area, and several in the Volga-Ural region.

INTERNATIONAL

Nigerian Crude

moves to Europe after long, costly exploration program.

NIGERIAN oil play came of age last week exactly 21 years after exploration first began when a tanker load of crude headed for a European refinery.

The 18,000-ton Royal Dutch-Shell tanker Hemifusus picked up the first cargo at Port Harcourt for delivery to the Pernis refinery in the Netherlands. The load was the first return on a program that has so far cost $75 million.

About 3,100 bbl. daily is now delivered to Port Harcourt storage. Three Afam wells are now producing 2,500 bbl. daily, carried out by a 30-mile, 6-in. pipeline. Oloibiri accounts for the remaining 600 bbl., brought out by barge. When a 65-mile, 8-in. line is completed in March, output from four Oloibiri wells will be stepped up to 3,500 bbl. daily.

Shell-BP Petroleum Development Co. of Nigeria, Ltd., has earmarked $28 million for exploration and development this year. It has five rigs running and seven seismic parties in the field. Nine outfits, including two drilling barges for work in tidal swamps, will be operating by the end of the year.

The company has drilled 19 wildcats since it entered the country in February 1937. The third discovery, at Soku, was announced a few weeks ago (OGJ, Feb. 17, p. 83).

BP Starts Up Big Crude Unit

AN 80,000-BBL. crude unit has gone on stream at British Petroleum Co.'s Kent refinery. The new unit temporarily makes the refinery the biggest in the United Kingdom.

The distillation unit is the first part of an $84-million expansion that will be completed by October. It raises the capacity of the refinery to 180,000 bbl. daily. This will be the biggest in the country until a 70,000-bbl. unit is completed this year at the 160,000-bbl. Fawley refinery of Esso Petroleum Co., Ltd.

Other units going up at Kent are a 12,000-bbl. thermal reformer, a 10,000-bbl. Platformer, a 20,000-bbl. BP Hydrofiner, and a 2,250-bbl. alkylation plant. The operating company, B.P. Refinery (Kent), Ltd., expects to open most of the special units in April. Facilities for making aviation gasoline will be ready in August.

ARAMCO'S platform heads down the Mississippi to the sea. It's a . . .

Barge Headed for Persian Gulf

A MOBILE drilling platform capable of drilling in 65 ft. of water is moving through the Atlantic Ocean en route to Saudi Arabia, where it will operate offshore for Arabian American Oil Co.

The small-sized platform was built by R. G. LeToureau, Inc., and will be used in conjunction with Aramco's "Queen Mary" drilling barge, which has done offshore work at Safaniya and Manifa fields (OGJ, Aug. 19, 1957, p. 116).

The platform is designed to carry a 136-ft. by 30-ft. standard derrick, a draw works driven by electric motor, and an individual motor-driven rotary table.

A 4-ft. high drilling subbase will hold the drilling unit. The subbase will be skidded from a center position on the platform to an overhung position for drilling operations.

Prior to drilling, however, the operators will erect a simple production platform for use as a cellar during drilling operations. When drilling is completed, the christmas tree will be mounted on the platform above water.

Oil produced from wells drilled in this manner will be collected in trunk lines and brought onshore to gas-oil separator facilities.

The mobile drilling platform now en route to the Middle East is roughly triangular in shape, 93 ft. long, and 104 ft. wide. It has three triangular open truss legs elevated by electric-motor-driven pinions with racks on the legs. The legs will rise at the rate of 1 ft. per minute.

The mobile platform has a 10-ft. clearance between the bottom of the hull and the water surface. Total weight, except for drilling equipment, is about 800 tons.

The platform left New Orleans January 15 and has averaged 95 miles per day during its 10,000-mile voyage so far. It should arrive at Aramco's marine terminal at Ras Tanura in the Persian Gulf in late April. The Dutch tug Noord Holland is towing.

New Australian Search Set

WEST AUSTRALIAN Petroleum Pty., Ltd. will concentrate its men and equipment for an all-out exploration effort in the Canning and Fitzroy basins this year.

The company has already rigged up for an 8,000 to 10,000-ft. test in the Samphire Marsh area, and its "full seismic strength" is now working on locations for further tests.

The Canning and Fitzroy basins cover nearly 100,000 sq. miles in the Kimberleys, a remote area on the northwest coast of Australia. The region is about 400 miles northeast of the Exmouth Gulf area, where the company made its flash-in-the-pan discovery at Rough Range 4 years ago.

The crew for Samphire Marsh 1 is moving up from Learmonth 1, in the Exmouth Gulf area, which has been abandoned at 7,636 ft. The rig for the new wildcat was moved 250 miles from Frazier River, where it was stacked after drilling a 10,144-ft. duster 2 years ago.

Papua Exploration

disappoints Stanvac. Firm may cut financial support.

ONE OF THE BACKERS of the oil play on Papua is on the verge of withdrawing financial support.

The Australian subsidiary of Standard-Vacuum Oil Co. has given notice that it will not kick in for the fourth well in the current drilling program unless three tests now drilling are greatly encouraging. Cost of the new well, Kuru 3, would run to $1,800,000.

Stanvac said that commercial production possibilities on the Australian part of New Guinea still could not be written off. But its decision to cut off funds came after a medium gas flow was obtained from a test at Barikewa (OGJ, Feb. 10, p. 84).

Stanvac and British Petroleum Co., Ltd., each holds about 45 per cent interest. An Australian firm, Oil Search, Ltd., holds the remainder.

If BP goes ahead with the program, Stanvac will not lose its investment in the operation, but its interest will be diluted. The American-based company has spent nearly $27-million since joining the program in 1937.

Besides the Barikewa test, wells are under way at Puri and Komewu. They will be completed about midyear.

The Kuru structure, site of the final test in the series, caused the most excitement so far when the first wildcat hit a shallow high-pressure gas formation 2 years ago and ran wild for 6 months.

Italy Studies New Oil Bill

PRIVATE COMPANIES will get a crack at exploration in the Po Valley if a bill expected to go to the Italian cabinet becomes law.

The bill is being prepared by the ministry of industry as a means of stepping up exploration in northern Italy, where Ente Nazionale Idrocarburi now has exclusive rights. ENI has developed major natural-gas fields in the valley, but its crude production there is small.

Under the terms of the bill, ENI would be required to give up 10 per cent of its acreage every 3 years until it held a maximum of 50 per cent of its present territory. The first reduction would take place within 6 months after passage of the law.

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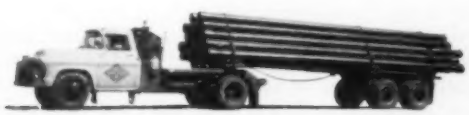

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Refinery Proposed at Karachi

MARKETING COMPANIES in Pakistan have recommended Karachi for the location of a proposed refinery. The proposal came in a survey report made at the request of the government.

If the survey findings are approved, the plant will be built east of Keamari Groyne on Karachi harbor. The site lies south of several existing tank farms and packaging plants.

M. J. Condon, general manager for Burmah Oil Co., Ltd., in Pakistan, presented the report to M. Khurshid, secretary of the ministry of industries of the Pakistan Government (photo). With him were J. W. Smith, general manager of Standard-Vacuum Oil Co. Ltd. (left), and W. L. Butt, manager of Caltex Oil (Pakistan), Ltd. A Royal Dutch-Shell subsidiary is the fourth marketing company participating in the project.

The report contains a joint proposal by the companies for setting up the country's first major refinery. An eight-man team composed of refining engineers and marine experts made a study of the location and marine facilities.

The plant will probably be large enough to make West Pakistan self-sufficient in most products.

Attock Oil Co., Ltd., operates the country's only refinery, a 6,000-bbl. plant at Rawalpindi.

Indonesian Picture Muddled

OIL COMPANIES operating in Indonesia are in the middle of a political dispute between a weak central government and rebellious island military leaders who have set up a separate regime.

Last week the biggest puzzle appeared to be something like: Who has the ball?

At Padang, on the island of Sumatra, Dr. Sjafruddin Prawiranegara, head of the rebel regime, said his government is cutting off the flow of oil money to the central government at Djakarta on Java. The oil companies say all this is news to them.

The rebel premier said his government has ordered Standard-Vacuum Oil Co. and Caltex to stop paying oil royalties to Djarkata and that the oil companies have agreed. In New York both companies disclaimed any knowledge of such an order.

A Caltex spokesman said his headquarters has not been notified of any such move by its people in Sumatra.

Dr. Prawiranegara told newsmen at Padang that his government had talked the situation over with Caltex and "an arrangement" was made. He refused to give any details. The rebel officials have also said that they would be happy to grant Stanvac the new concessions it wants and has not been able to get from the central government on Java.

The rebels are apparently in firm control of central Sumatra, the source of most of Indonesia's oil. They are in a position to block exports of oil entirely, but official sources emphasized that this is the last thing they want.

A spokesman said the rebel regime wants full production to continue and more money to roll in. But, they want the royalty and taxes paid locally in Sumatra instead of Java.

For the companies it's going to be a case of making a choice and paying the money—with a good chance of choosing wrong.

Crude-Price Control

proposed in Peru. Production costs would determine prices.

THE OLD BUGABOO of price controls has cropped up again in Peru.

A clause in a bill now before the Peruvian Congress would base the price of domestic crude on a formula tied to production costs and future investments by producers.

The clause is a part of a bill concerned chiefly with a proposed gasoline tax which would pay for a road-building program. The legislation has already passed the Chamber of Deputies.

Michael L. Haider, president of International Petroleum Co., Ltd., the largest producer, said that if the price of crude is fixed the incentive to develop new and existing fields will be seriously impaired.

He added that Peru would be the only country in the world not recognizing that domestic crude value should be based on the price the oil would bring in international markets.

Prices on most major refined products have been low for years. Under the present law, prices are reviewed semiannually on the basis of crude prices on the world market and refining costs.

This system went into effect 4 years ago when the country faced the prospect of importing oil. Local demand was increasing and there was no corresponding gain in crude production. Until then, prices had been held under even more rigid control.

International Petroleum has a $40-million, 3-year expansion program under way on a 138,000-acre concession in which it has obtained half interest from Cia. Petrolera Lobitos. The two companies account for more than 90 per cent of Peruvian crude production, which totals about 52,000 bbl. daily.

International Petroleum has the only major refinery in the country, a 47,000-bbl. plant at Talara.

A study of the

FUTURE PRODUCTIVE CAPACITY

and

PROBABLE RESERVES of the U. S.

BY WARREN DAVIS

Fourfold purpose

THIS IS A STUDY of the factors affecting United States crude-oil production and reserves. Several forecasts of crude-oil production have been published. This particular study differs from previously published ones because the results were obtained taking account of not only the usual physical factors, but also those economic factors thought to be most pertinent. These economic factors are difficult to estimate accurately. For this reason, the method is designed to show the effect of changes in these factors. While this does not sharpen the accuracy of the results at a given time, it does permit continual revision to improve the accuracy of the forecasts.

An example of these economic factors is the price of crude oil. It seems fairly obvious that the future price of crude oil is bound to affect future producing rates. How much it is going to affect them cannot be determined unless some method is evolved which takes into account variations in the price of crude oil, and then forecasts made for several different prices. This was done for this factor and for several others in this study.

The purpose of this study is:

1. To determine what factors are most likely to affect the ultimate oil recovery of the United States and estimate the ultimate recovery under a variety of conditions.

2. To develop a method of predicting the future productive capacity of the United States.

3. To calculate some examples varying the more important factors to determine what range of answers is probable.

4. To encourage further study of this subject. It is reasonably certain that if other people are interested enough in this subject to try this method, then through their ideas on the subject both the method and answers obtained will probably be improved.

ANY ANALYSIS in which predictions of future producing capacity are made involves a consideration of reserves, because reserves are our underground store of oil from which we may draw upon for production. On a short-term basis there are many other factors which are more important than reserves in determining producing rate of a single field.

When we think of long-term productive capacity of a large number of fields, then crude-oil reserves become the one best measure of productive capacity. It is not a serious oversimplification of the problem to consider the annual productive capacity of the U. S. as a per cent of reserves. In the long run, we can maintain a given producing rate only if we are adding to our reserves at a greater rate than we are depleting them.

API reserve estimates have been available for about the past 20 years. During this period the annual rate of withdrawal of United States crude reserves has never exceeded 10 per cent of the reserves. This was true even during World War II when the country as a whole was considered to be producing at its "maximum efficient rate." This would indicate a capacity based on 10 per cent of the reserves per year should be reasonable.

On the other hand, the report of the National Petroleum Council Committee on Productive Capacity dated October 3, 1957, estimates the producing capacity of the United States to be 11.8 per cent of reserves per year. Part of this difference is due to the fact that the NPC figure is meant to be a physical-capacity figure. It is also partly due to recent improvements in production technology, for example, the advent of formation fracturing.

It is difficult to justify expenditures for pipelines and refineries to serve fields with less than a 10-year supply at current rate. Therefore, it is questionable if the production rate of the United States would be increased further once it reached 10 per cent per year. On the other hand, it is easily possible that even if reserves were declining, the producing rate would be sustained until it had reached the physical capacity figure of about 12 per cent per year. Consequently, if it is possible to estimate what the reserves

WARREN DAVIS

The author describes a method developed for estimating the future United States crude-oil reserves and crude productive capacity. The method described takes account of both physical and economic factors. Use of the method indicates that petroleum demand, import restrictions, and the rate at which reserves may be produced (physical production) all affect the producing rate on a short-term basis, but they do not have a significant effect on the ultimate volume of oil to be recovered in the United States. The barrels of reserves developed per total foot drilled and the price of crude oil affect not only the producing rate but also the ultimate recovery of the United States.

Predictions were made using this method with optimistic assumptions which include an increase in crude-oil price of about $1.00 per barrel over the next 7 years (the real price of crude oil has not increased in the past 7 years*). The predictions indicate that U. S. fields will be producing at capacity by 1967.

Warren Davis, the author, is an evaluation engineer with Gulf Oil Corp., Pittsburgh, attached to the staff of P. H. Bohart, vice president in charge of planning and economics. Davis was brought up in Tulsa and graduated in petroleum engineering from University of Tulsa in 1941 with one of the highest grade averages earned with that department. He immediately went to work with Gulf and has had wide experience in oil-production work, reservoir engineering, reserves, and petroleum economics. Davis was chief reservoir engineer at Tulsa, before being transferred to Pittsburgh in 1956.

*The average posted price of crude has increased from $2.51 per barrel to about $3.10 per barrel in the last 7 years, but the price in 1956 dollars has not changed appreciably. If the past trend of decline in the value of the dollar continues, this $1.00 per barrel increase assumed in the next 7 years will increase posted price to $4.65 per barrel by 1967.

will be at a future date, it should be reasonably safe to estimate that annual productive capacity is between 10 and 12 per cent of reserves.

Reserves and Drilling

Drilling is the one activity which has the most direct effect on production. Drilling and completion of wells accounted for about 40 per cent of all estimated petroleum production expenditures in the year 1953. A sizable portion of the remainder was spent on closely related activities. Drilling and production may best be related through reserves. The completion of a successful well makes available underground reserves of crude. The long-term productive capacity, in turn, depends on these reserves. The results of the petroleum industry's drilling is a critical factor in determining the future productive capacity.

The ideal way of measuring the results of drilling would be with finding and development costs per barrel, but accurate data would be very difficult to obtain. A good substitute for this is the ratio of total reserve additions to total footage drilled in all wells. These data are readily obtainable and can be handled fairly easily.

Fig. 1 is a plot of the results of oil-industry drilling in the United States. On this curve are plotted barrels of reserves developed per foot drilled against cumulative reserves developed. We will call the ratio of barrels of reserves established to feet drilled "drilling return." The barrels of reserves are total additions to reserves in a given year per API figures (i.e., discoveries plus extensions and revisions). The footage drilled is a total figure for all wells both exploratory and development. The cumulative reserves developed as of the end of a given year is the sum of the cumulative production from all U. S. fields through that year and the proved reserves at that time. It is all oil that has been found and developed to date.

Each point on the solid curve represents a year's activities. The period covered by all the data shown is 1936-1956. The drilling return could have been plotted against time instead of cumulative reserves developed; the resulting curve has about the same configuration as Fig. 1. Time was not used as the horizontal scale because there is no readily apparent reason why drilling return should decline just because time has passed. It is reasonable to expect that as more reserves are developed, there are less left to develop and the effort required to find and develop a barrel of oil increases.

Drilling less productive . . . Fig. 1 indicates that the barrels of reserves developed per total foot drilled is declining steadily as more oil is found and developed. This condition is the net result of two opposing factors—first, as less oil is left to find, finding is more difficult, and second, the efficiency of our exploration methods is steadily improving. This decline in drilling return is a critical fact and all of the calculations made and the conclusions drawn in this article are based on this fact.

For any fixed set of prices and costs, the industry will ultimately reach a point where the profit from drilling and producing oil wells is no longer adequate. Therefore, unless economic conditions change greatly, there is a definite limit to the volume of oil to be found and produced profitably in the United States.

Three extrapolated trends are shown in Fig. 1. The one labeled "best" is an extrapolation of the 21-year trend 1936-1956, and the one labeled "worst" is an extrapolation of the trend of the last 9 years. The "average" line was drawn midway between the

"New recovery methods . . . should improve drilling returns."

other two. If the ability of the producing industry to find oil improves at about the same rate as it has improved during the last 9 years, then we could expect to continue along the trend labeled "worst." Offshore operations should account for an increasing part of our drilling effort. These operations generally have a high return.

New recovery methods, such as in situ combustion, may be expected to increase and they, too, have a high return. These factors should help to improve the trend of our drilling return. However, it should also be pointed out that during the past 9 years waterflood development has been at a record rate and some offshore development has occurred. In spite of this, the drilling return has declined at an accelerated rate. Thus the curve labeled "best" must be considered a very optimistic extrapolation of the past trends and the curve labeled "average" could be considered as showing a guarded optimism.

Smaller fields . . . One reason for the past decline in barrels of reserves per foot drilled is the steadily increasing per cent of all wells drilled which were dry holes. This, in turn, may be accounted for by the fact that while the development-dry hole ratio and the exploratory-well-dry-hole ratio have not changed much, the percentage of all wells drilled which were exploratory wells has steadily increased. This indicates that the successful exploratory wells are finding smaller fields on the average. This conclusion is borne out by AAPG statistical data. They show that during the period 1938-1952 the Class E fields (less than one million barrels ultimate recovery) increased from about 50 per cent to over 75 per cent of all fields found. The Class A and B fields (over 25 million barrels ultimate recovery) decreased from about 7 per cent to about 1½ per cent of the total.

Past Drilling Rates

Fig. 1 in conjunction with an estimate of drilling rates should enable us to estimate future reserve additions. Therefore, the next item of data required is an estimate of drilling. There are indications that the availability of capital has always been the primary factor in determining the U. S. petroleum industry's rate of drilling. Most of this capital has been retained from earnings, and several correlations between crude-oil revenue and drilling have been published. However, part of the capital for drilling comes from sources outside the petroleum industry. The availability of this outside capital seems to depend primarily on the general level of the economy. This factor should be measurable by the gross national product.

An equation relating drilling, crude-oil revenue, and gross national product was derived, using data for the periods 1929-1941 and 1946-1955. The World War II period was omitted, because drilling was determined by artificial controls rather than natural economic factors. This equation was:

$$P_D = 0.80\ (P_R + P_G) \qquad (1)$$

where:

P_D = percentage change in total footage drilled from last year's figure

P_R = percentage change in crude oil revenue from last year's figure

P_G = percentage change in gross national product from last year's figure

The data used to compute P_R and P_G must be expressed in constant-value dollars. All figures were corrected to 1956 dollars on the basis of retail commodity prices in the 1955 edition of Business Statistics published by the U. S. Department of Commerce.

Fig. 2 shows how good a job this equation does of describing past drilling rates. On a long-term basis it does a very good job of describing U. S. drilling for the periods 1929-1941 and 1946-1956. The average error is about 5 per cent. This equation takes no account of short-term factors; such as, availability of steel, the short-term business outlook, etc. For that reason it can be considerably in error if it is used to predict next year's drilling. Such use of this equation is not recommended, but on a long-term basis, it appears to work well.

Profitability of Drilling

It would seem as though the profitability of drilling should affect the drilling rate. The fact that Equation 1, which does not consider profitability, describes past drilling rates fairly well indicates that the profitability of drilling has not had much effect in the past. If the drilling return continues to decline and the average price of crude oil fails to rise enough to compensate for it, then eventually the profitability of drilling will fall so low that it is bound to affect the drilling rate. There are no past data to indicate when and how this might occur. But it appears inevitable, and any estimates made without taking it into account have a good chance of being wrong.

In order to estimate under what conditions profitability will affect drilling, let us consider an average development well. We will assume that we are at the point 10 bbl. per ft. and 105 billion barrels on Fig. 1 (this falls on the "best" extrapolation). According to Fig. 3 this well would be 4,600 ft. deep. In calculating total footage attributable to this well and total expenditures attributable to the reserves developed, we must consider all of the following:

1. The cost of development dry holes which developed no reserves but inevitably must be drilled in order to complete the successful wells. U. S. experience has been fairly consistent showing that 20 per cent of the development wells are dry holes. Therefore, we must assume that for this average development well, we will drill one-fourth of a development dry hole.

2. Other producing equipment needed to operate oil fields; such as, fresh-water systems, salt-water-disposal systems, pressure-maintenance plants, etc. These now approximate 30 per cent of drilling costs, but cannot be expected to be reduced by future technological developments to the same extent as drilling.

3. Exploratory drilling: Fig. 3 indicates that at the cumulative reserve developed figure for these examples, 36.5 per cent of all footage drilled will be in exploratory wells and that the average exploratory well will be 5,400 ft. deep. Therefore, we may anticipate that 48 per cent of a 5,400-ft. exploratory well will be attributable to this particular development well.

4. Other exploration costs such as geological work, geophysical work, etc. This may be expected to approximate 200 per cent of the exploratory drilling costs.

Considering these items the footages drilled which are attributable to the reserves developed in this well are as follows:

Development well (Fig. 3), ft.	4,600
One-fourth of a development dry hole, ft.	1,150
48 per cent of a 5,400-ft. exploratory well (Fig. 3), ft.	2,600
Total, ft.	8,350
Gross reserves, (8,350 × 10 bbl./ft.), bbl.	83,500
Net reserves (83,500 × .875), bbl.	73,000

(This figure is the estimated reserves developed by an average development well.)

Exploration Cost

Average well 5,400 ft. deep—$60,000 (1953 cost, see Fig. 4). Decrease in cost because of improving drilling technology—0.85 (see Fig. 5), $60,000 × .85 = $50,400.

	Intangible costs	Leasehold cost	Total costs
Exploratory drilling, $50,400 × 0.48	$24,000	$ 0	$24,000
Other exploration costs (200 per cent of drilling) (geological, geophysical, etc.)	43,000	5,000	48,000
Subtotal	$67,000	$5,000	$72,000
Intangible tax credit (*50 per cent rate)	33,000	0	33,000
Net exploration cost	$34,000	$5,000	$39,000
Per barrel			$0.53

Development Cost

Average well 4,600 ft. deep—$47,000 (1953 cost). $47,000 × 0.85 (technology factor) = $40,000 (see Fig. 5).

	Intangible costs	Equipment costs	Total costs
Development drilling	$28,000	$12,000	$40,000
Producing equipment (incl. plants, salt water disposal systems, etc.)	0	15,000	15,000
Development-dry-hole costs	10,000	0	10,000
Subtotal	$38,000	$27,000	$65,000
Intangible tax credit (*50 per cent rate)	19,000	0	19,000
Net development cost	$19,000	$27,000	$46,000
Per barrel			$0.63
Depreciation charge, per bbl.		$0.37	
Total investment, per bbl.			$1.16

Operating Cost

Lifting cost: Use $275/well-mo. avg. = $9.20/day.

Average production 12.1 bbl./day/well ($9.20/12.1), per barrel	$0.76
Production or ad valorem tax, per barrel	$0.20
Overhead, per barrel	$0.18
Total operating cost, per barrel	$1.14

*This tax rate varies from 20 to 91 per cent for individuals, and is 52-54 per cent for corporations. No data were available to estimate the average rate accurately, but in view of the large number of incorporated producing companies, it should be near the corporate rate.

We may calculate the average operating profit per barrel to be obtained from this well over its entire life for various per barrel revenues as follows:

	$3.00/bbl.	$3.75/bbl.
1. Assume total revenue		
2. Direct operating expense	0.96	1.00
3. Depreciation	0.37	0.37
Subtotal	1.33	1.37
4. Depletion allowance	0.59	0.85
5. Overhead	0.18	0.18
Subtotal tax deductions	2.10	2.40
6. Taxable income	0.90	1.35
7. U. S. income tax at 50 per cent	0.45	0.68
8. Total cash outlay (2 + 5 + 7)	1.59	1.86
9. Operating profit	1.41	1.89

For average conditions in the United States if the ratio of operating profit to investment is about 1.5 the producer will make an average annual return on his investment of about 10 per cent. In view of the risk inherent in producing operations, it is unlikely that any producer will stay in business long for a smaller return.

Interpolating the above figures, this would give a total revenue of $3.51 per barrel needed for the average well to make a 10 per cent return. Reading from Fig. 6 we can see that 62 cents per barrel of this could be obtained as gas revenue. (This is not gas revenue from oil wells alone but includes gas wells too. This is necessary because gas wells are included in the drilling figures used to calculate drilling return.) Therefore, the crude-oil price would have to be $2.89 per barrel.

This same type of calculation was made for other drilling returns and yielded the following crude-oil prices needed to give the operator of the average well an average return of 10 per cent per annum.

Bbl. per ft.	Crude-oil price, $ per bbl.
5	$5.29
10	2.89
15	2.29
20	1.96

If the **average** producing well barely makes its operator an adequate return, then half of all wells drilled would not make an adequate return. This would not maintain the incentive to drill all available locations. A greater price is needed to support a full-scale drilling effort.

Retaining the shape and slopes of the curve calculated, the curve was arbitrarily adjusted upward. There are indications that the price in 1956 was barely adequate to maintain incentive; therefore, the curve was shifted to pass through the point ($2.82, 12.6 bbl. per ft.). Fig. 7 is a plot of these adjusted figures. The area beneath this curve indicates conditions where the profitability of drilling for crude oil is doubtful, and the area above this curve indicates the conditions when the drilling for crude oil is reasonably certain to be profitable. This curve depicts average conditions for the entire United States and any attempt to apply it to a single specific area could be very misleading.

What effect on drilling? . . . The next point for consideration is, "What happens if the U. S. average drilling

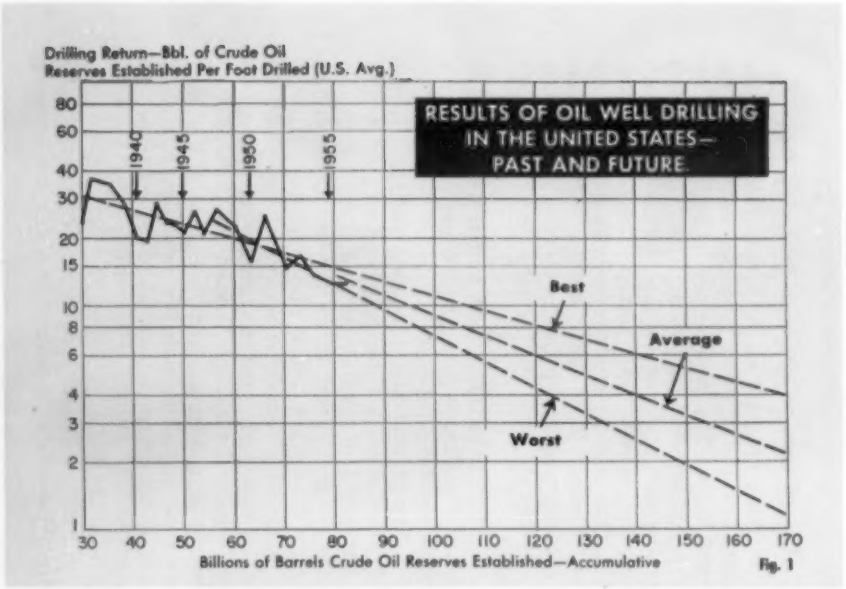
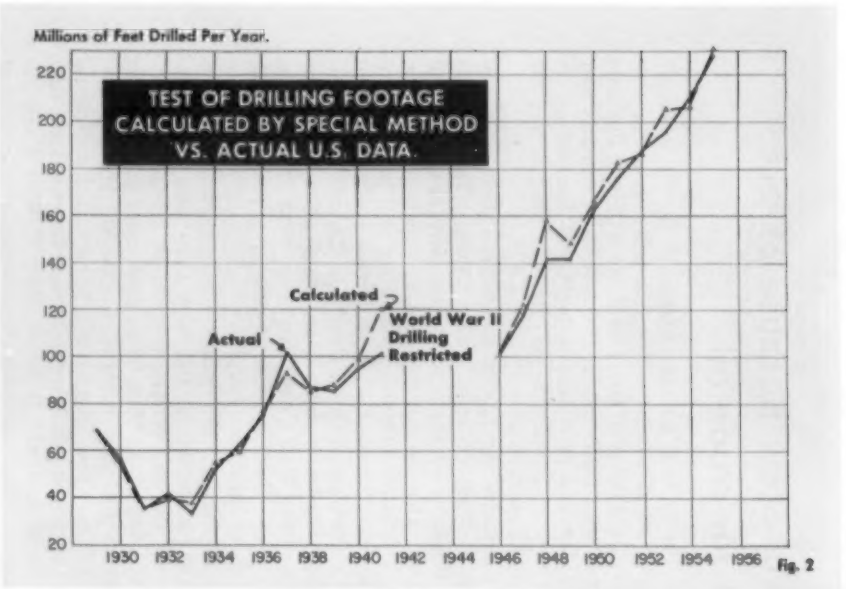
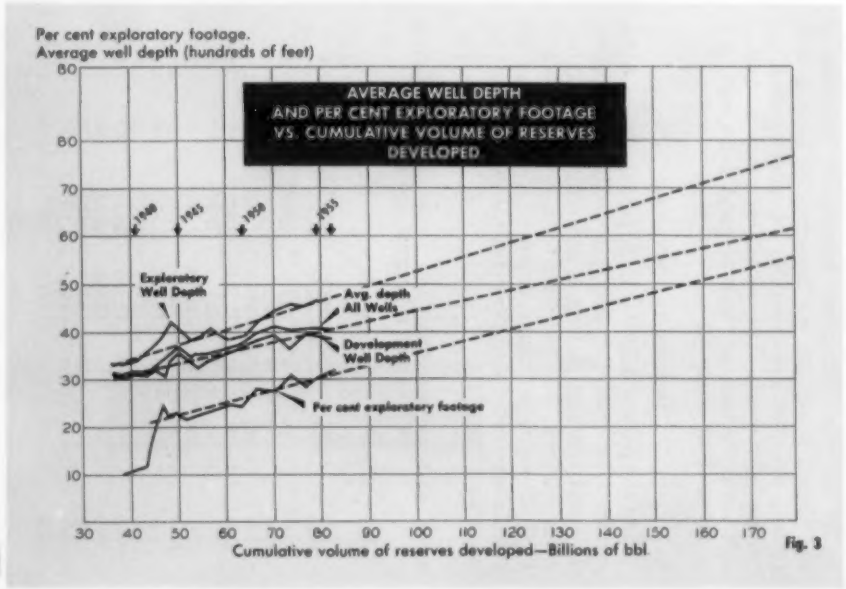
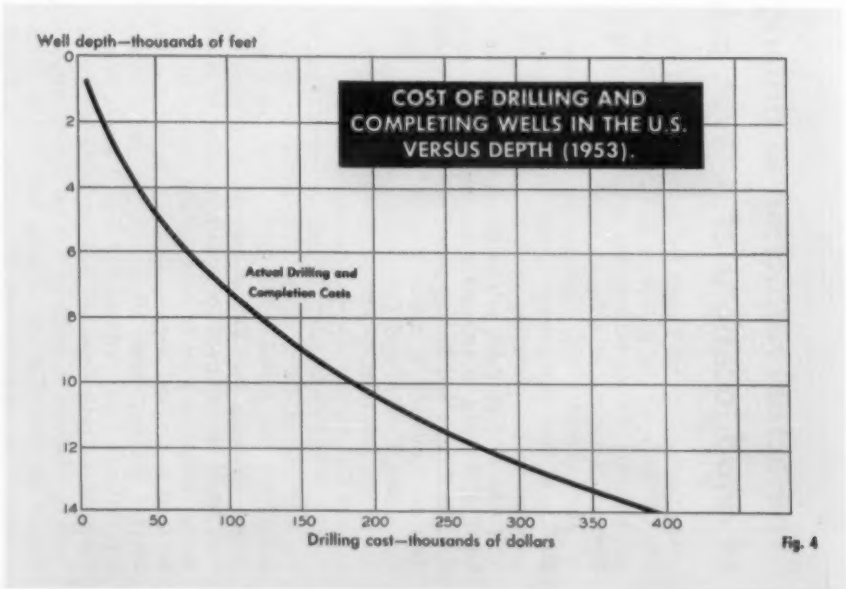


Fig. 1


Millions of Feet Drilled Per Year.
TEST OF DRILLING FOOTAGE CALCULATED BY SPECIAL METHOD VS. ACTUAL U.S. DATA.
Calculated
Actual
World War II Drilling Restricted
Fig. 2


Per cent exploratory footage.
Average well depth (hundreds of feet)
AVERAGE WELL DEPTH AND PER CENT EXPLORATORY FOOTAGE VS. CUMULATIVE VOLUME OF RESERVES DEVELOPED.
1940
1945
1950
1955
Exploratory Well Depth
Avg. depth All Wells
Development Well Depth
Per cent exploratory footage
Cumulative volume of reserves developed—Billions of bbl.
Fig. 3


Well depth—thousands of feet
COST OF DRILLING AND COMPLETING WELLS IN THE U.S. VERSUS DEPTH (1953).
Actual Drilling and Completion Costs
Drilling cost—thousands of dollars
Fig. 4

"The actual reduction in drilling will occur because of lack of good locations at a given price for crude oil."

return declines so that it falls below the curve of Fig. 7?" Certainly all the producers in the United States will not stop drilling because the below-average locations will not make an adequate profit.

They probably will eliminate enough low-return drilling to keep the average return up to that corresponding to the prevailing crude-oil price on Fig. 7. This selectivity probably will be by geologic provinces, but it is difficult to estimate it on this basis because data on drilling and drilling return are needed. These data are available by states using API reserve estimates and The Oil and Gas Journal drilling figures. Texas and Louisiana can be subdivided by using The Oil and Gas Journal reserve estimates.

Fig. 8 was made using the drilling return of states (or portions of states where they could be broken down) for the period 1951-1955. This curve was drawn assuming that the average U. S. drilling return could be improved by greatly reducing or eliminating drilling in areas of poor drilling return. It may be used as follows: Suppose that Fig. 1 indicates the average drilling return will be 10 bbl. per ft. for a full drilling effort. Assume that Fig. 7 shows that at the crude-oil price expected, a return of 12 bbl. per ft. must be obtained in order to stay on the "profitable" side of the line. Then the drilling return must be increased to 12, an increase of 20 per cent. Fig. 8 indicates that in order to do this, drilling must be reduced by 30 per cent. The many independent operators in the United States are not conscious of their drilling return, but they are conscious of whether they are getting good wells. The actual reduction in drilling will occur because of "lack of good locations" at a given price of crude oil.

Demand for Petroleum

At the present time the U. S. producing rate is determined by demand rather than productive capacity. This will continue as long as productive capacity exceeds demand. The following table is an estimate of U. S. domestic petroleum demand. It also shows the calculations converting these figures to "demand" for domestic crude oil:

U. S. FUTURE PICTURE, ASSUMING AN UNLIMITED SUPPLY OF DOMESTIC CRUDE

Year	Domestic petroleum demand	Exports and stock changes	Total new supply needed	Total (all U. S.) imports	Nat. gas liquids	"Demand" for U. S. crude oil
1957	8,890	620	9,510	1,540	800	7,170
1958	9,150	350	9,500	1,600	800	7,100
1959	9,640	335	9,975	1,760	825	7,390
1960	10,000	320	10,320	1,880	840	7,600
1961	10,400	305	10,705	2,040	865	7,800
1962	10,700	290	10,990	2,170	880	7,940
1963	11,100	280	11,380	2,310	920	8,150
1964	11,500	270	11,770	2,480	940	8,350
1965	11,900	260	12,160	2,655	955	8,550
1966	12,300	250	12,550	2,820	975	8,755
1967	12,700	240	12,940	2,995	995	8,950
1968	13,150	230	13,380	3,180	1,020	9,180
1969	13,600	220	13,820	3,360	1,060	9,400
1970	14,100	215	14,315	3,545	1,090	9,680

The table is not an estimate of the U. S. supply and demand balance as it will actually occur. It is an estimate of what it would be if the supply of domestic crude were unlimited. It is based on an estimate that the domestic petroleum demand will increase by an average of about 3½ per cent per year during the next 12 years or so.

Probably the figures in this tabulation most subject to estimation error are the imports. The estimates in this table are the author's best guess as to what will occur. They do not represent any company's opinion of a desirable import level. They are based on an indefinite extension of the voluntary controls initiated by a Presidential Order dated July 29, 1957. The import estimates in Table 1 are based on crude imports east of the West Coast increasing about 3½ per cent per year. Product imports were assumed to increase at about their past rate.

At the time the estimates were made, there were no crude quotas for the West Coast and it was assumed that the present volumes of crude and products going to the West Coast from other U. S. sources will be gradually increased to 200,000 bbl. per day, and West Coast imports will be increased sufficiently to supply the remaining difference between local supply and demand. However, even if West Coast refiners are required to use more domestic crude instead of imports to supply part of their local deficit, the long-range picture will not be affected greatly.

Use of Data to Calculate Producing Rates

We have discussed all the various factors that are needed to calculate future producing capacities of the United States. The problem now is to put them together and arrive at an answer. This is accomplished by taking each year, one at a time, and carrying through a reserve balance. Each year is treated as follows:

1. Start with the crude reserves at the start of the year. Multiply it by the maximum withdrawal rate to obtain producing capacity for the year. The smaller of capacity or crude oil "demand" is crude-oil production.

2. Multiply producing rate by estimated crude-oil price to obtain crude-producing revenue. Calculate per cent change from previous year.

3. Use per cent change in crude producing revenue and estimated per cent change in gross national product in Equation 1 to calculate per cent change in drilling. Apply per cent change to the previous year's drilling to get current year's drilling rate—uncorrected.

4. Knowing cumulative reserves developed at the start of the year, read uncorrected drilling return from Fig. 1. Using Fig. 7, determine if the drilling return is adequate at the crude price used. If it is, then there is no correction to drilling or drilling return.

5. If the return is not adequate, determine the return needed. Determine correction factor for drilling from Fig. 8.

6. Multiply drilling rate by drilling return (using corrected values if necessary) to obtain total reserve

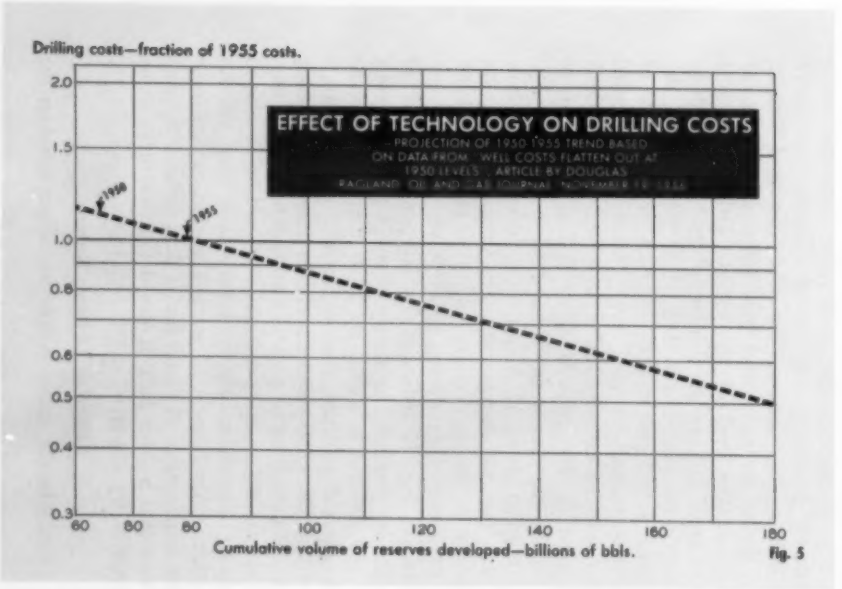

Drilling costs—fraction of 1955 costs.
EFFECT OF TECHNOLOGY ON DRILLING COSTS
PROJECTION OF 1950-1955 TREND BASED ON DATA FROM "WELL COSTS FLATTEN OUT AT 1950 LEVELS," ARTICLE BY DOUGLAS RAGLAND, OIL AND GAS JOURNAL, NOVEMBER 19, 1956
1950
1955
2.0
1.5
1.0
0.8
0.6
0.5
0.4
0.3
60 80 80 100 120 140 160 180
Cumulative volume of reserves developed—billions of bbls.

Fig. 5

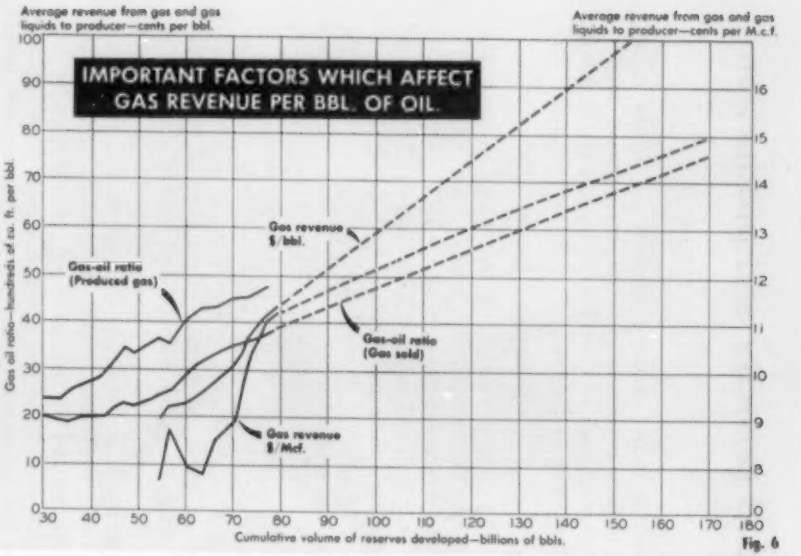

Average revenue from gas and gas liquids to producer—cents per bbl.
Average revenue from gas and gas liquids to producer—cents per M.c.f.
IMPORTANT FACTORS WHICH AFFECT GAS REVENUE PER BBL. OF OIL.
Gas revenue $/bbl.
Gas-oil ratio (Produced gas)
Gas-oil ratio (Gas sold)
Gas revenue $/Mcf.
Gas oil ratio—hundreds of cu. ft. per bbl.
100 90 80 70 60 50 40 30 20 10 0
16 15 14 13 12 11 10 9 8 0
30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180
Cumulative volume of reserves developed—billions of bbls.

Fig. 6

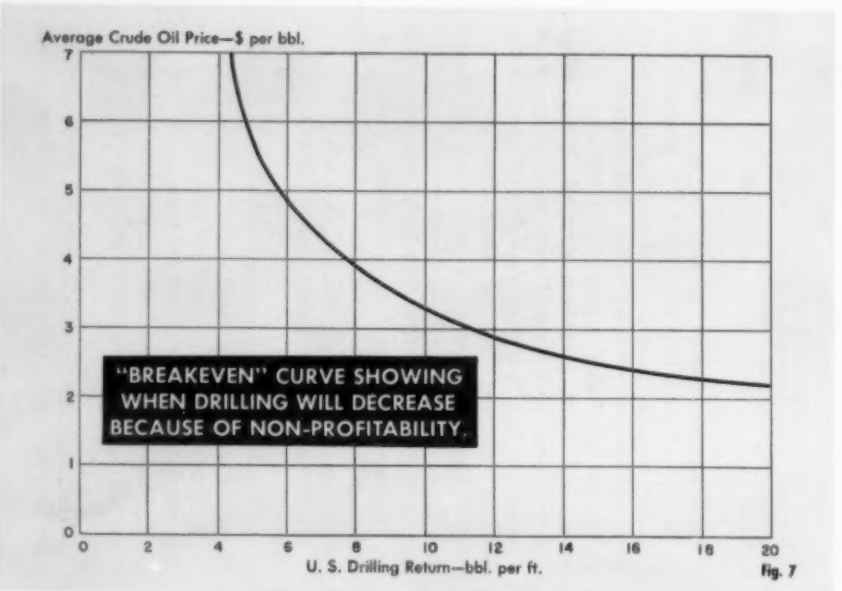

Average Crude Oil Price—$ per bbl.
"BREAKEVEN" CURVE SHOWING WHEN DRILLING WILL DECREASE BECAUSE OF NON-PROFITABILITY.
7 6 5 4 3 2 1 0
0 2 4 6 8 10 12 14 16 18 20
U. S. Drilling Return—bbl. per ft.

Fig. 7

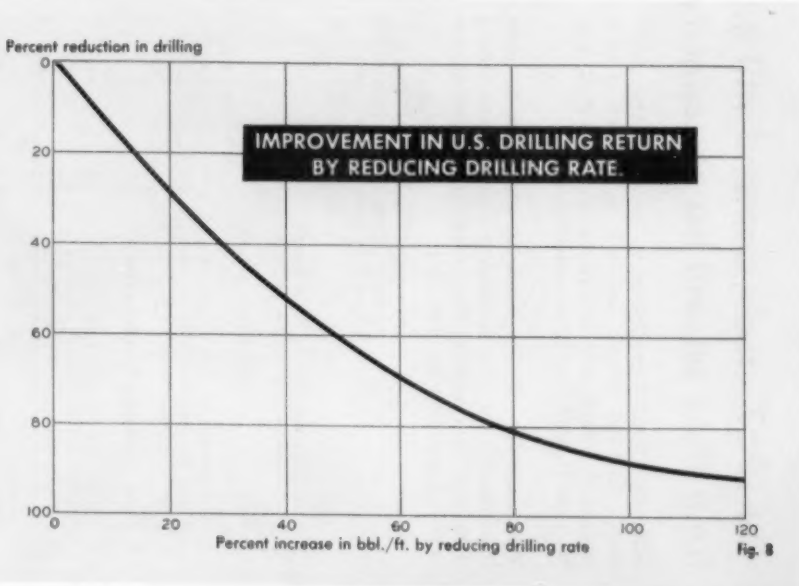

Percent reduction in drilling
IMPROVEMENT IN U.S. DRILLING RETURN BY REDUCING DRILLING RATE.
0 20 40 60 80 100
0 20 40 60 80 100 120
Percent increase in bbl./ft. by reducing drilling rate

Fig. 8

"By 1967 crude demand will exceed capacity and production from then on will be at capacity."

additions. Deduct production to get net reserve additions. Add net reserve additions to reserves at start of year to obtain year-end reserves. This figure may be used to start next year's calculations.

Two examples . . . The following tabulations illustrate the calculations. This is done to show the mechanism both with and without the correction in drilling because of profitability limitation:

	Case I Drlg. limited only by capital	Case II Drlg. limited also by profitability
1. Year	1959	1967
2. Proved Reserves, Jan. 1—billon barrels	31.884	31.782
3. Cum. Reserves Developed Jan. 1—billion barrels	92.046	115.501
4. Productive Capacity—billion barrels, year	3.188	3.178
5. "Crude Demand"—billion barrels	2.697	3.270
6. Actual Production—billion barrels	2.697	3.178
7. Actual Production—million barrels, day	7.39	8.71
8. Crude Producing Revenue—Million, $/day	22.1	26.1
9. Per cent change in revenue	2.5	—0.7
10. Per cent change in GNP	2.7	2.3
11. Per cent change in drilling. (per Eq. 1)	4.2	1.3
12. Uncorrected drilling—million feet.	268.1	355.0
13. Drilling Return w/full drilling effort—bbl./ft. (Fig. 1)	12.2	8.6
14. Minimum Drilling Return—bbl./ft. (Fig. 7)	11.4	11.4
15. Correction Factor for drilling (Fig. 8)	1.00	0.56
16. Corrected Drilling—million feet	268.1	198.8
17. Total reserve additions—billion barrels	3.279	2.267
18. Net reserve additions—billion barrels	0.582	—0.911
19. Proved reserves, Dec. 31—billion barrels	32.466	30.871

This process may be repeated for as many years as desired. Certain factors must be assumed or estimated in order to make these calculations. Among these factors are crude-oil price, drilling-return extrapolation, producing capacity as a per cent of reserves, and U. S. petroleum demand. These things usually cannot be estimated with great accuracy. In view of this fact it is very desirable to consider the effect of variations in these basic data. Using the method described above, it is very simple to change these basic data. These calculations are time consuming, but they are repetitive. This is the situation where an electronic computer is particularly good. This particular problem was programed for an IBM-650 medium-speed computer. The variables were:

1. Drilling return using "best," "average," and "worst."

2. Crude price was assumed to be $3, $4, $5 and $6 per bbl. (in 1956 dollars).

3. Producing capacity as a per cent of reserves per year, using 10 and 12 per cent per year.

4. Petroleum demand was assumed to increase at about 3½ per cent per year and 1½ per cent per year.

When each one of these factors is varied independently of the others, this makes 48 different conditions. It is not practical to show the results of all 48 of these conditions. However, comparisons obtained by varying each of these factors in turn are shown in the sections to follow.

Example of Results

Fig. 9 is an example of the results obtained. For this case the assumed data were:

1. Average drilling return.

2. Crude oil price will be increased to $4 per barrel over the next 7 years.

3. Petroleum demand will be that shown in the previous tabulation.

4. The maximum reserve withdrawal rate of the U. S. will be held to 10 per cent per year.

These are obviously pretty optimistic assumptions. The average drilling return expresses a guarded optimism about the future. In the light of the present situation an increase in the real price of crude oil to $4 per barrel seems very optimistic. In the past the only time the price has shown a sharp increase was in the period 1945-1948. The inflationary pressure of shortages and the relaxation of wartime controls had their effects. If the past trend of inflation continues this $4 per barrel price expressed in 1956 dollars would mean a crude oil price of about $6 per barrel in current dollars by 1980.

Fig. 9 indicates that under these assumed conditions the producing rate would increase from 1957 to 1966 as the "demand" for crude increased. During this period the productive capacity would increase at first and then level off. In 1965 the drilling rate must be reduced to keep the drilling return high enough to maintain the incentive to drill. From this time on, the drilling is reduced steadily because of the "lack of good locations." By 1967 the crude demand exceeds the producing capacity and production from then on is at capacity. The peak U. S. producing rate of about 9 million barrels per day is achieved in 1967.

Fig. 10 shows U. S. petroleum demand and how it was met for the period 1930-1956. It shows the manner in which demand might be met 1957-1980 if the crude-oil-producing rates shown in Fig. 9 are obtained. Fig. 10 indicates that imports and shale oil might be permitted to supply about 2 million barrels of the demand in 1960. By 1970 imports and shale oil required will have risen to about 5 million barrels per day. By 1980 requirements for imports and shale oil will have risen to about 14 million barrels per day. It seems very unlikely that shale oil will be developed rapidly enough to supply a very large part of this deficit within the next 20 years. Therefore, unless some new large source of liquid fuel is developed, it appears likely that a large part of this deficit will have to be supplied by imports.

Effect of Drilling Return

Undoubtedly, many people would not consider the

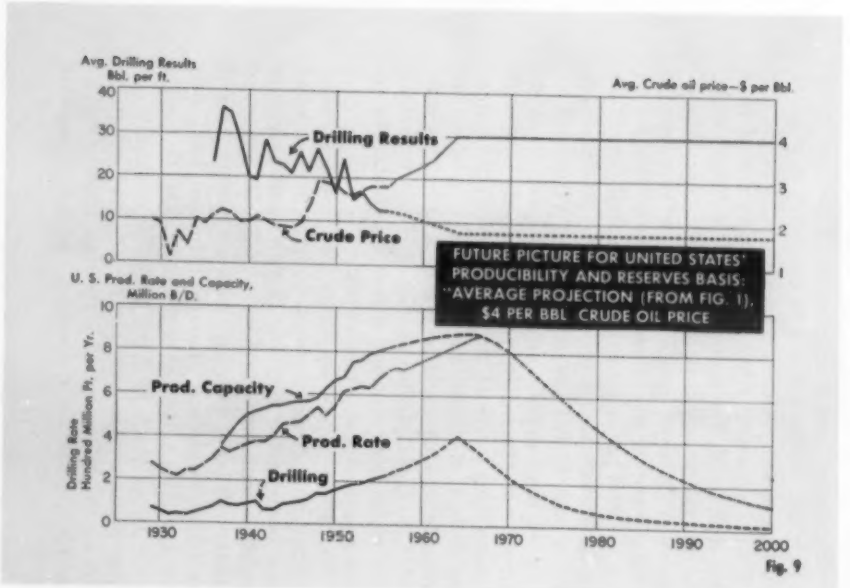


Fig. 9

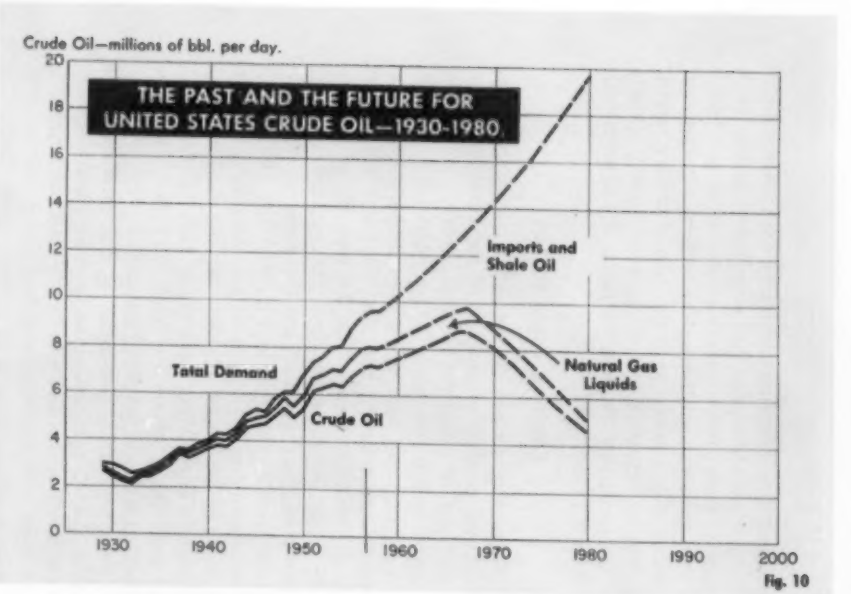


Fig. 10

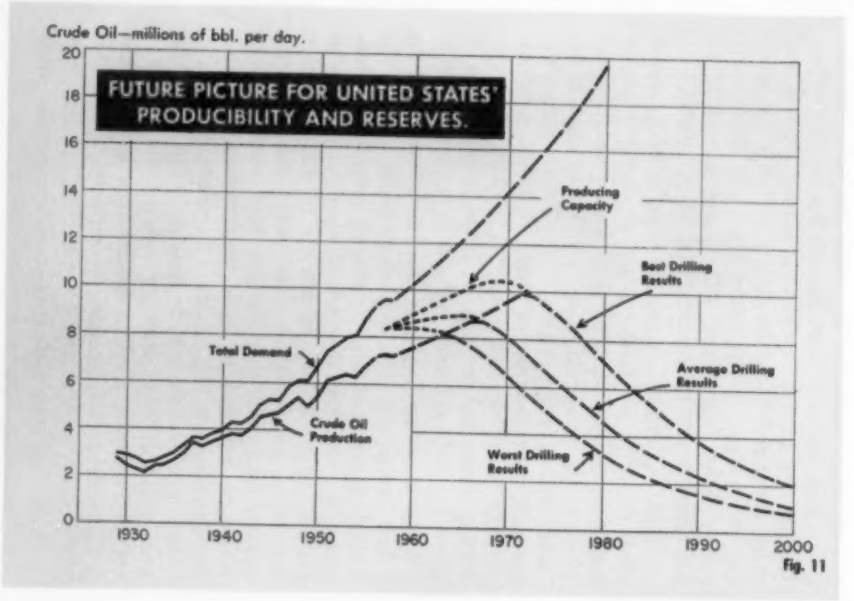


Fig. 11

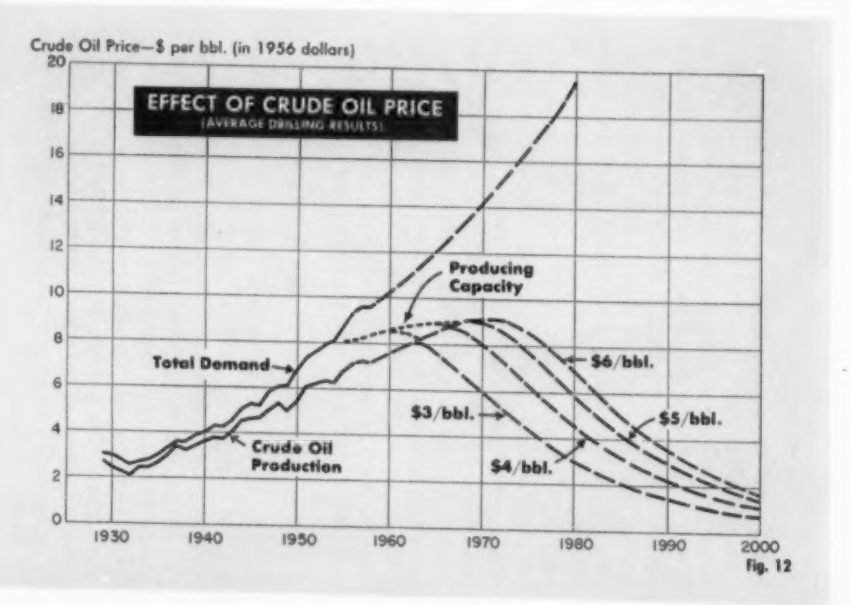


Fig. 12

average drilling-return extrapolation the most likely one. To illustrate what effect variations in drilling-return extrapolation have on the results Fig. 11 was drawn. It indicates that if the "best" drilling return is obtained then the production should peak at about 10 million barrels per day in about 1972. Whereas if the "worst" drilling return is obtained, then production will peak at a little over 8 million barrels per day in about 1964. All of this is retaining the assumption of an ultimate $4 crude oil price. The drilling return has a considerable effect on the ultimate recovery. At a $4 price the "worst" drilling return gives an ultimate recovery of about 125 billion barrels and the "best" about 165 billion barrels. Unfortunately, not much control can be exercised over this factor. About all that can be done is to watch the trends and attempt to improve forecasts as more data are obtained.

Effect of Crude-Oil Price

Fig. 12 was drawn to show the effect on producing rate of changes in crude-oil price. The $3 per barrel closely approximates the present price in 1956 dollars. To obtain the other prices, it was assumed the price would be steadily increased until the assumed maximum price was reached. The exact schedule of increase is not critical. No attempt was made to forecast crude prices. Those used were assumed to calculate the effect of price variations over a range somewhat greater than is likely to occur.

In Fig. 12, the increase from $3 to $4 defers the year of peak production and raises the peak. The increase from $4 to $5 does likewise but has less effect. The increase from $5 to $6 only flattens the top part of the curve and defers the decline period a few years. For the average drilling return the U. S. ultimate recovery varies from about 125 billion barrels at $3 per barrel to 160 billion barrels at $6 per barrel.

With the "best" return, the benefits of increased crude oil price are greater. Each successive price increase defers the start of declining production and increases the peak producing rate. In the case of the "best" drilling return and the $6 per barrel crude price, the peak producing rate of about 11.7 million barrels per day is not reached until 1975. With "average" drilling return and the present crude price, a peak of about 8.2 million barrels per day is reached in 1963.

The foregoing discussion raises the question, "If the prices considered are not adequate to enable the United States domestic producing industry to continue to meet the demand indefinitely, then what price is adequate?" In an attempt to determine this, the calculation method previously described was worked backwards to determine what crude-oil price would be required to meet the estimated demands previously shown. Fig. 13 shows the results of these calculations. It may be seen by looking at this figure that even with the "best" drilling return the crude oil price required to enable the U. S. producing industry to meet the demand rapidly reaches unreasonable figures after about 1970.

Crude-oil price is determined by competitive conditions, and this is beyond control by the industry itself. It is common knowledge that government actions such as tariffs, import restrictions, etc., do control the degree of competition. Anything that affects competition probably affects price. As in the case of drilling return, the best a forecaster can do is watch trends closely and try to narrow the possible range of estimates with additional experience.

Effect of Other Factors

A previous section discussed the question of what the annual productive capacity of the United States is in per cent of reserves. There is certainly reasonable doubt as to whether this is 10 per cent or 12 per cent. The 10 per cent rate might be thought of as good conservation practice and the 12 per cent rate as actual physical capacity. Fig. 14 was drawn to compare producing rates for these two assumptions. The other conditions assumed are the same as those assumed for the example in Fig. 9. When the 12 per cent assumption is used, it delays the decline in producing rate by about 3 years, but the decline is accelerated. The 12 per cent curve falls below the 10 per cent curve about 10 years after the peak. The effect on ultimate crude-oil recovery is negligible.

One very likely possibility is that production will follow the 10 per cent curve to peak shown. At that point it will seem desirable to maintain the producing rate even with declining reserves, but it will be difficult to justify expansion of facilities so to further increase the rate. In such a case the productive rate might be held constant until it reaches the 12 per cent curve at which time production will be essentially at physical capacity and will decline.

Fig. 15 shows the effect on producing rate of variations in demand. The curve labeled "probable" is the same as the example in Fig. 9. The one labeled "maximum" is based on a 5 per cent per year increase in demand and the one labeled "minimum" is based on a 1½ per cent per year increase in demand. The effect of a faster increase in demand is for production to reach a peak sooner and decline more rapidly. Some of the oil is produced sooner, but ultimate crude recovery is not affected by greater demand. Obviously the same thing is true of the effect of moderate restrictions or lack of restrictions on imports. A sharp reduction in imports could be expected to increase current U. S. crude production, but it would have little effect on ultimate recovery unless the restrictions resulted in a change in crude oil price.

The effect of drilling return and average crude-oil price on ultimate crude-oil recovery in the United States is shown in Fig. 16. Demand and maximum possible withdrawal rate have a negligible effect on ultimate recovery. Ultimate recovery plotted here is cumulative production through the year 2000 plus proved reserves at the end of the year 2000. This might be low by as much as 5 per cent of the ultimate recovery because of reserves proved after 2000. A figure of about 150 billion barrels is the right order of magnitude for the optimistic conditions of the example in Fig. 9.

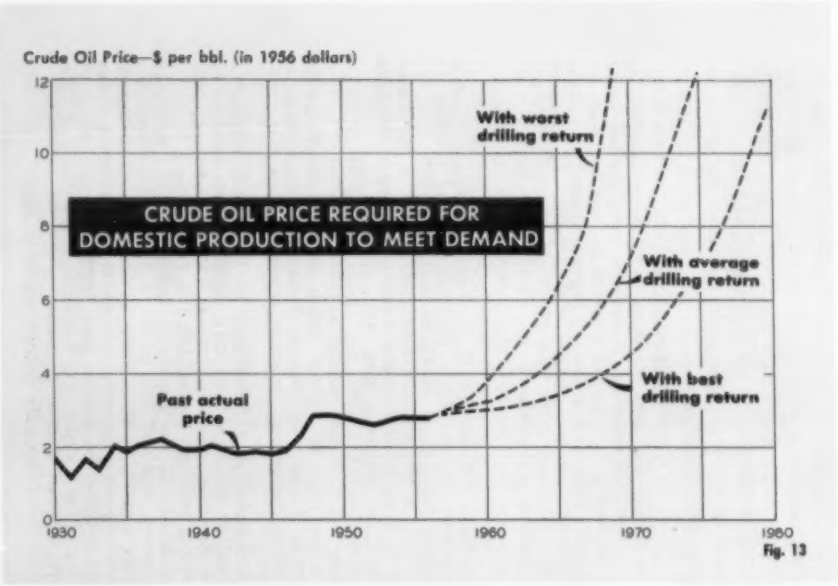


Fig. 13

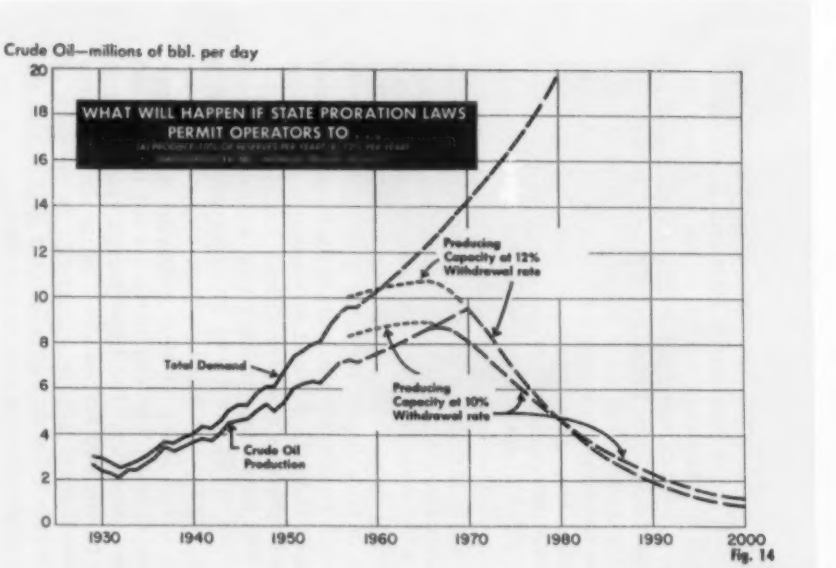


Fig. 14

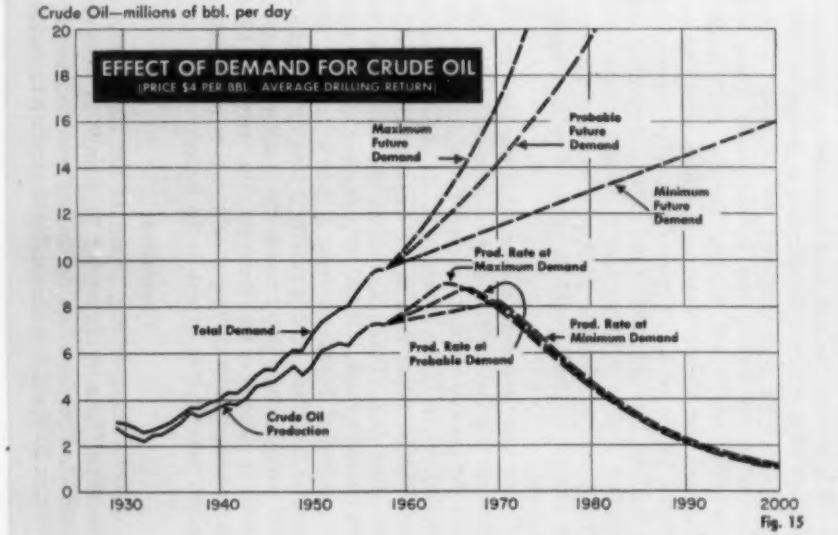


Fig. 15

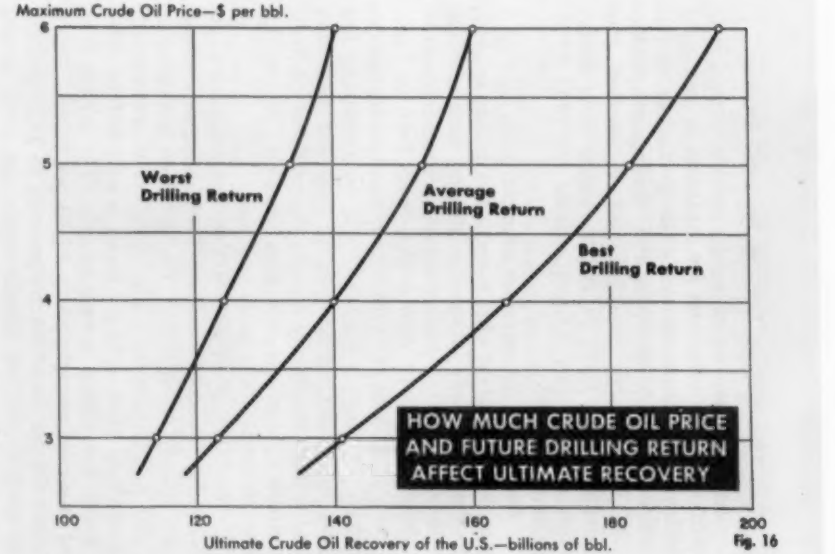


Fig. 16

Will This Method Account for 1957 Drilling?

An important test of any forecasting method is to check how well it accounts for conditions as they occur following the initial forecast. The predictions in this article were made before the 1957 drilling and production figures were available and a question that inevitably must occur to anyone reading these predictions is: "Will this method account for 1957 U. S. drilling results?"

Obviously, the principal example given in Fig. 9 does not account for what happened to drilling in 1957. It shows a steady increase in drilling from 1956 to 1964, whereas the drilling actually declined by about 4,000 wells, or 13 million feet, from 1956 to 1957. There are at least two possible explanations for this decrease. The first is that 1957 was an abnormally low year. Equation (1) is designed for long-term predictions and will not necessarily describe the next year's drilling. Perhaps tight money, low allowables, etc., account for the decrease.

The other possibility is that the mechanism described in the section entitled "Profitability of Drilling" has already taken effect. The decrease in drilling in 1957 is approximated if the "worst" drilling return and a crude oil price of $3 per barrel is used and the curve in Fig. 7 is shifted upward slightly. (The current price of crude oil averages about $3.10 per barrel. This is about $3 per barrel when converted to 1956 dollars). In such a case, we should expect the 1957 drilling return to be held to about its 1956 value (i.e. 12.6 bbl. per foot) by the decrease in 1957 drilling.

If it is really "lack of good locations" at the present price of oil that caused the decrease in drilling in 1957, and the present price continues, we can expect further decline in the drilling rate in the future. Using the conditions which will account for the 1957 drilling decrease, the United States as a whole would be expected to use up all its excess producing capacity by sometime between 1961 and 1964, depending on whether a 10 or a 12 per cent maximum reserve withdrawal rate was feasible. Peak production would occur in this period and would be about 8 million barrels per day.

One fact supporting the idea that the 1957 drilling decrease was due to "lack of good locations" is the fact that the greatest decrease occurred in states where the drilling return is the lowest (e.g., Oklahoma, Kansas, and Illinois) rather than in the areas most affected by proration (e.g., Texas, Louisiana and New Mexico). On the other hand, it would be premature to draw such a conclusion based on only 1 year's results. The method described here is strictly a long-range method and giving a single year's results too much weight could result in some very bad forecasts. The results of 1958 and perhaps 1959 drilling should give us much better insight into what to expect in the future.

Conclusions

The average drilling return of the United States petroleum industry expressed in barrels of reserves established per total foot drilled has been declining for the past 20 years. It is reasonable to expect it to decline further in the future. Therefore, unless the real price of crude oil is continually increased in the future enough to compensate for the decline in drilling rate, there is some definite limit as to the volume of crude oil ultimately to be found and produced in the U. S.

The past drilling rates of the United States as a whole can be approximated fairly well by the use of an equation that takes account of change in crude oil revenue and change in gross national product. There is considerable doubt as to whether this relationship can be expected to hold indefinitely in the future. It is very likely that the profitability of drilling which apparently has not affected the drilling rate in the past will affect it in the future. There are no well-founded empirical data to indicate what this effect will be, but even theories should be better than ignoring it. In any case a quantitative estimate of the future producing capacity of the U. S. based on reasonable assumptions is preferable to vague generalities.

With the average drilling return, a maximum crude oil price of $4 per barrel (in 1956 dollars) and a producing capacity based on good conservation practices, United States crude-oil production should reach a peak of about 9 million barrels per day in 1967 and decline thereafter. The time of peak producing rate may be extended beyond 1967, but to do so requires crude-oil prices that are unrealistic. If the price of crude only keeps up with inflation it is likely that the peak production will occur before 1967.

Unless there is some drastic change in the cost of exploration and drilling the only two factors that may be expected to have an important effect on the ultimate recovery of crude oil in the United States are drilling return trend and crude-oil price. Petroleum demand, moderate import restrictions, and rate of withdrawal of reserves have only a temporary effect on productive capacity.

Acknowledgments

In making this study the advice and help of many people in the Gulf Companies, and in other oil companies was sought and obtained. J. L. Schweizer prepared the data and made the preliminary calculations needed. Ali Baghai programed the problem for IBM-650 computer. The aid of these people and permission of the management of the Gulf Oil Corp. to publish this article are gratefully acknowledged.

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(Appendix follows on next page)

APPENDIX

Gulf will gladly furnish any individual or company wishing to use this method a copy of the program, the input and output card format, and some accompanying explanatory material. This material is in such a form that it will be useless to anyone who is not an experienced IBM-650 programer. If you wish to obtain this material, address your requests on company letterhead to Gulf Oil Corp., P. O. Box 1166, Pittsburgh 30, Pa. Attention: R. J. Baxter.

How the calculations for this study were programed

When the method of calculating results described in this article was evolved, it quickly became apparent that the calculations would be a large job. For each of the 48 different conditions to be considered, manual calculations for a 45-year period would require about 8 hours. This meant that manual calculation and checking of the results would require over 2 months. The chance for human error in these calculations is very great because each year's calculations depend upon the results of the previous year's figures. Any error made in the first few years would be carried through the entire results.

Both the time factor and the desire to minimize errors led to the conclusion that these calculations could best be done by electronic computing machinery. The methods unit of the comptroller's department in Gulf's Pittsburgh office coordinates activities such as this. Close coordination is required to efficiently operate Gulf's two IBM-650 machines in Houston, one in Port Arthur, one in Philadelphia, one in Pittsburgh, a similar computer at Harmarville, and an IBM-704 computer now authorized for installation at Gulf Research & Development Co. in Harmarville.

The computational problem was taken to R. J. Baxter, of Gulf's method unit. Because of the complexity of this problem, he arranged to have one of Gulf's most experienced 650 programers work on it, Ali Baghai, of the manufacturing department.

Baghai is an Iranian by birth. His high-school education was obtained in France and Germany and his undergraduate college education in Iran. He is now a permanent resident of U. S., and since coming to the United States, he has obtained advanced degrees at University of Michigan.

Baghai, shown in the accompanying picture sitting at the controls of Gulf's Pittsburgh office IBM-650 machine, used the automatic programing technique which was developed by Dr. A. J. Perlis and his associates at the computer center of Carnegie Institute of Technology.* The flow diagram of this program along with sample output data cards are shown. a Type 407 tabulator board was wired so that the output data for each year may be printed on a separate line with the machine location codes and the floating decimal codes eliminated. A sample tabulation is shown.

It took about 3 weeks to design the program, and machine debugging time was about 13 hours. The running time to calculate and punch approximately 6,500 output cards for one run is about 4½ hours. One run covers 48 different sets of predictions for a period of 45 years in the future. Considering the programing time and the machine debugging time, the first run was about a breakeven proposition as compared to making the calculations by hand. However, even here the intangible benefit of reducing the probability of error made it worth while. Each successive rerun results in a very considerable saving as compared to making the calculations by hand. Present plans call for a complete review of the data and a new machine run at least once a year.

*Internal Translator (IT) A Compiler for the 650, by A. J. Perlis, J. W. Smith, H. R. van Zoeren, Computation Center, Carnegie Institute of Technology, 650 Library Program, File No. 2.1.001.

MORE ON THIS STUDY . . .

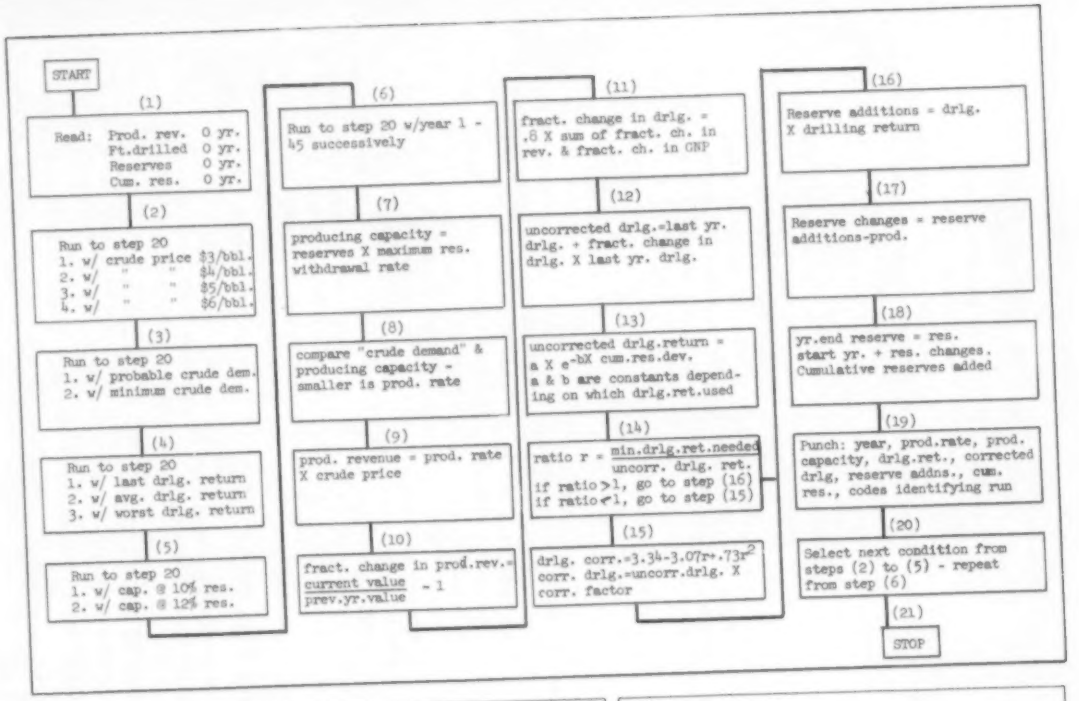
See next two pages for punch cards and computer flow diagrams.

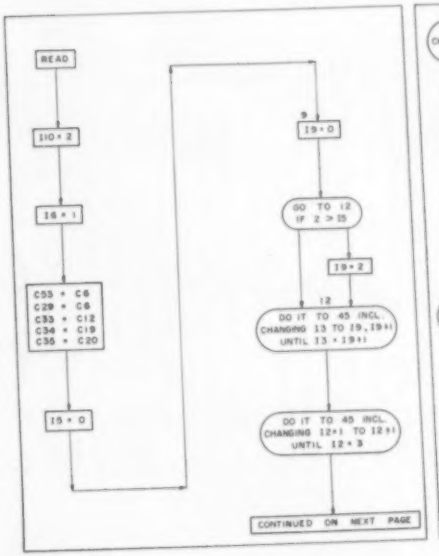
CALCULATION OF U.S. PRODUCING RATE RUN NO.3 MEDIAN DRILLING RETURN
PROBABLE DEMAND MAXIMUM DEPLETION RATE 10 PER CENT MAXIMUM CRUDE-
OIL PRICE $ 4.00

CALC YEAR	RESERVES JAN 1 MM BLS	PRODUCTION RATE MM BPD	PRODUCTION CAPACITY MM BPD	DRILLING RETURN BBL/FT	TOTAL DRILLING MM FT	RESERVES ADDED MM BLS	CUM RES DEV MM BLS
1957	3043.5000	7.3100000	8.3383561	12.250461	255.19433	3126.2452	88423.248
1958	3089.3098	7.2100000	8.4638624	11.486391	264.13866	3033.9999	91457.248
1959	3129.5448	7.3900000	8.5740953	10.790462	282.10616	3044.0558	94501.304
1960	3164.2154	7.6000000	8.6690832	10.134598	301.86595	3059.2901	97560.594
1961	3192.7444	7.8000000	8.7472448	9.5156124	322.01037	3064.1259	100624.72
1962	3214.4570	7.9400000	8.8067314	8.9335416	348.75736	3115.6384	103740.36
1963	3236.2108	8.1500000	8.8663309	8.3781811	379.02204	3175.5153	106915.88
1964	3256.2873	8.3500000	8.9213350	7.8476584	410.09063	3216.2512	110134.13
1965	3273.3374	8.5500000	8.9680476	7.3442613	393.34416	3028.7500	113162.88
1966	3264.1374	8.7600000	8.9428421	6.9000390	363.85495	2801.6831	115964.56
1967	3224.5657	8.8344265	8.8344265	6.5130806	331.19046	2550.1665	118514.73
1968	3157.1258	8.6496596	8.6496596	6.1797591	293.95524	2263.4553	120778.19
1969	3067.1598	8.4048185	8.4048185	5.8982279	259.85770	2000.9043	122779.09
1970	2961.0734	8.1125298	8.1125298	5.6600536	229.46148	1766.8534	124545.94
1971	2841.6514	7.7853462	7.7853462	5.4577488	202.56851	1559.7775	126105.72
1972	2713.4640	7.4341479	7.4341479	5.2851710	179.16029	1379.5342	127485.25
1973	2580.0710	7.0686876	7.0686876	5.1370884	158.89589	1223.4984	128708.75
1974	2444.4137	6.6970238	6.6970238	5.0092320	141.39991	1088.7793	129797.53
1975	2308.8503	6.3256172	6.3256172	4.8981315	126.30289	972.53225	130770.06
1976	2175.2185	5.9595027	5.9595027	4.8009783	113.26389	872.13195	131642.19
1977	2044.9098	5.6024925	5.6024925	4.7154945	101.97960	785.24292	132427.43
1978	1918.9431	5.2573783	5.2573783	4.6398308	92.186596	709.83679	133137.27
1979	1798.0325	4.9261164	4.9261164	4.5724771	83.659704	644.17972	133781.45
1980	1682.6672	4.6099923	4.6099923	4.5122011	76.208463	586.80517	134368.26
1981	1573.0630	4.3097616	4.3097616	4.4579844	69.672239	536.47624	134904.74
1982	1469.4043	4.0257652	4.0257652	4.4089882	63.916577	492.15764	135396.90
1983	1371.6796	3.7580263	3.7580263	4.3645146	58.828563	452.97994	135849.88
1984	1279.8096	3.5063276	3.5063276	4.3239767	54.313431	418.21342	136268.09
1985	1193.6500	3.2702739	3.2702739	4.2868851	50.291872	387.24741	136655.34
1986	1113.0098	3.0493419	3.0493419	4.2528233	46.696911	359.56621	137014.91
1987	1037.6655	2.8429191	2.8429191	4.2214383	43.472128	334.73539	137349.65
1988	9673.7249	2.6503356	2.6503356	4.1924283	40.569928	312.38845	137662.04
1989	9018.7409	2.4708879	2.4708879	4.1655365	37.949788	292.21337	137954.25
1990	8409.0802	2.3038576	2.3038576	4.1405367	35.577206	273.94440	138228.19
1991	7842.1167	2.1485251	2.1485251	4.1172368	33.422828	257.35578	138485.55
1992	7315.2608	2.0041810	2.0041810	4.0954672	31.461284	242.25189	138727.80
1993	6825.9866	1.8701333	1.8701333	4.0750801	29.670925	228.46612	138956.27
1994	6371.8541	1.7457134	1.7457134	4.0559458	28.032977	215.85392	139172.12
1995	5950.5226	1.6302801	1.6302801	4.0379510	26.531259	204.29069	139376.41
1996	5559.7611	1.5232222	1.5232222	4.0209933	25.151596	193.66729	139570.08
1997	5197.4523	1.4239595	1.4239595	4.0049836	23.881693	183.88904	139754.97
1998	4861.5961	1.3319441	1.3319441	3.9898406	22.710802	174.87318	139928.84
1999	4550.3097	1.2466602	1.2466602	3.9754935	21.629454	166.54680	140095.39
2000	4261.8255	1.1676234	1.1676234	3.9618775	20.629371	158.84616	140254.24
2001	3994.4891	1.0943806	1.0943806	3.9489347	19.703168	151.71439	140405.95

Simplified Flow Diagram For Production Forecast Problem

Complete Diagram In Symbolic Computer Language


START
(1)
Read: Prod. rev. 0 yr.
Ft.drilled 0 yr.
Reserves 0 yr.
Cum. res. 0 yr.
(2)
Run to step 20
1. w/ crude price $3/bbl.
2. w/ " " $4/bbl.
3. w/ " " $5/bbl.
4. w/ " " $6/bbl.
(3)
Run to step 20
1. w/ probable crude dem.
2. w/ minimum crude dem.
(4)
Run to step 20
1. w/ last drlg. return
2. w/ avg. drlg. return
3. w/ worst drlg. return
(5)
Run to step 20
1. w/ cap. @ 10% res.
2. w/ cap. @ 12% res.
(6)
Run to step 20 w/year 1 - 45 successively
(7)
producing capacity = reserves X maximum res. withdrawal rate
(8)
compare "crude demand" & producing capacity - smaller is prod. rate
(9)
prod. revenue = prod. rate X crude price
(10)
fract. change in prod.rev.= current value / prev.yr.value - 1
(11)
fract. change in drlg. = .6 X sum of fract. ch. in rev. & fract. ch. in GNP
(12)
uncorrected drlg.=last yr. drlg. + fract. change in drlg. X last yr. drlg.
(13)
uncorrected drlg.return = a X e^-bX cum.res.dev.
a & b are constants depending on which drlg.ret.used
(14)
ratio r = min.drlg.ret.needed / uncorr. drlg. ret.
if ratio >1, go to step (16)
if ratio <1, go to step (15)
(15)
drlg. corr.=3.34-3.07r+.73r^2
corr. drlg.=uncorr.drlg. X corr. factor
(16)
Reserve additions = drlg. X drilling return
(17)
Reserve changes = reserve additions-prod.
(18)
yr.end reserve = res. start yr. + res. changes. Cumulative reserves added
(19)
Punch: year, prod.rate, prod. capacity, drlg.ret., corrected drlg, reserve addns., cum. res., codes identifying run
(20)
Select next condition from steps (2) to (5) - repeat from step (6)
(21)
STOP


READ
I10 = 2
I6 = 1
C53 = C6
C29 = C6
C33 = C12
C34 = C19
C35 = C20
I5 = 0
9
I9 = 0
GO TO 12 IF 2 >I5
I9 = 2
12
DO IT TO 45 INCL. CHANGING I3 TO I9,I9+1 UNTIL I3 = I9+1
DO IT TO 45 INCL. CHANGING I2=1 TO I2+1 UNTIL I2 = 3
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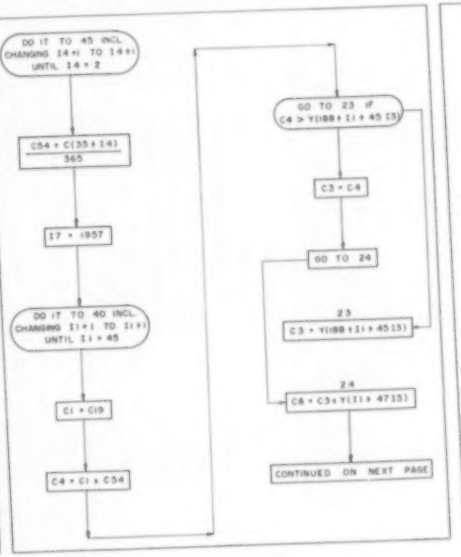
DO IT TO 45 INCL. CHANGING I4=1 TO I4+1 UNTIL I4 = 2
C54 = C(35+I4) / 365
I7 = 1957
DO IT TO 40 INCL. CHANGING I1=1 TO I1+1 UNTIL I1 = 45
C1 = C19
C4 = C1 x C54
GO TO 23 IF C4 > Y(188+I1+45 I3)
C3 = C4
GO TO 24
23
C3 = Y(188+I1+45 I3)
24
C6 = C3 x Y(I1+47 I5)
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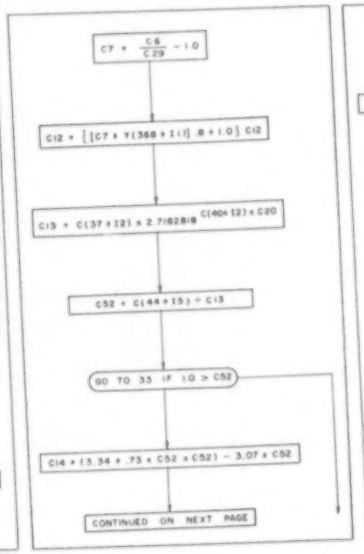

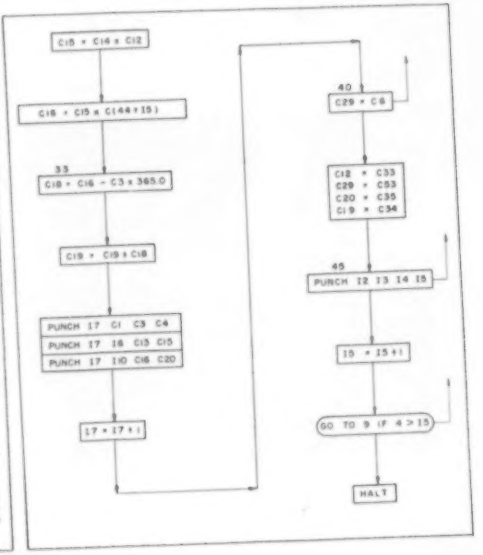

50803 **MANUFACTURING DEPARTMENT** — **CARD PUNCH DATA SHEET** — **GULF OIL CORPORATION**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	Remarks
	Machine location code for year										Year										Location code for reserves at beginning of year										Reserves at beginning of year Millions of bbls.										Location code for Producing Rate										Producing rate Million B/D										Location code for Productive Capacity Million B/D										Productive Capacity Million B/D											Card Labeled
	+								-																																																																																																		
0	1	0	0	0	7	0	0	3	6	0	0	0	0	0	0	0	1	9	5	6	0	3	0	0	0	1	0	0	3	6	3	0	0	1	2	0	0	0	5	4	0	3	0	0	0	3	0	0	3	6	7	1	5	0	0	0	0	0	5	0	0	3	0	0	0	4	0	0	3	6	8	7	9	8	0	3	8	2	5	0	(1)
	Location code for year										Year										Location code for counter										Counter-to let printer distinguish this card from other 2										Location code for Drilling Return										Drilling Return B/Ft.										Location code for Corrected Drilling Rate										Corrected Drilling Rate Million Ft.											
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0	1	0	0	0	7	0	0	3	7	0	0	0	0	0	0	0	1	9	5	6	0	1	0	0	0	6	0	0	3	7	0	0	0	0	0	0	0	0	0	1	0	3	0	0	1	3	0	0	3	7	1	4	1	3	6	3	2	4	5	1	0	3	0	0	1	5	0	0	3	7	2	4	7	9	5	3	0	4	5	2	(2)
	Location code for year										Year										Location code for counter										Counter-to let Printer distinguish this card from other 2										Location code for Total Reserve Additions										Total Reserve Additions Million Bbls.										Location Code for Cumulative reserves developed										Cumulative reserves developed Million Bbls.											
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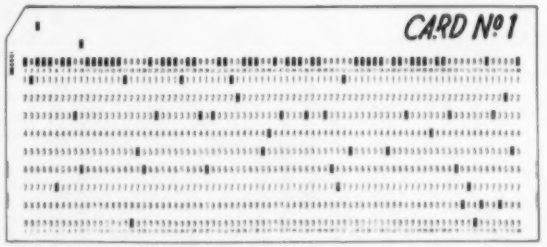

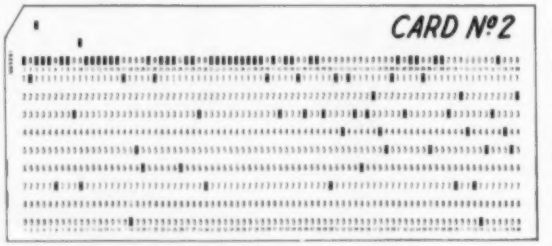

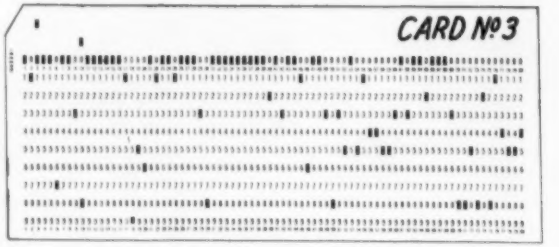

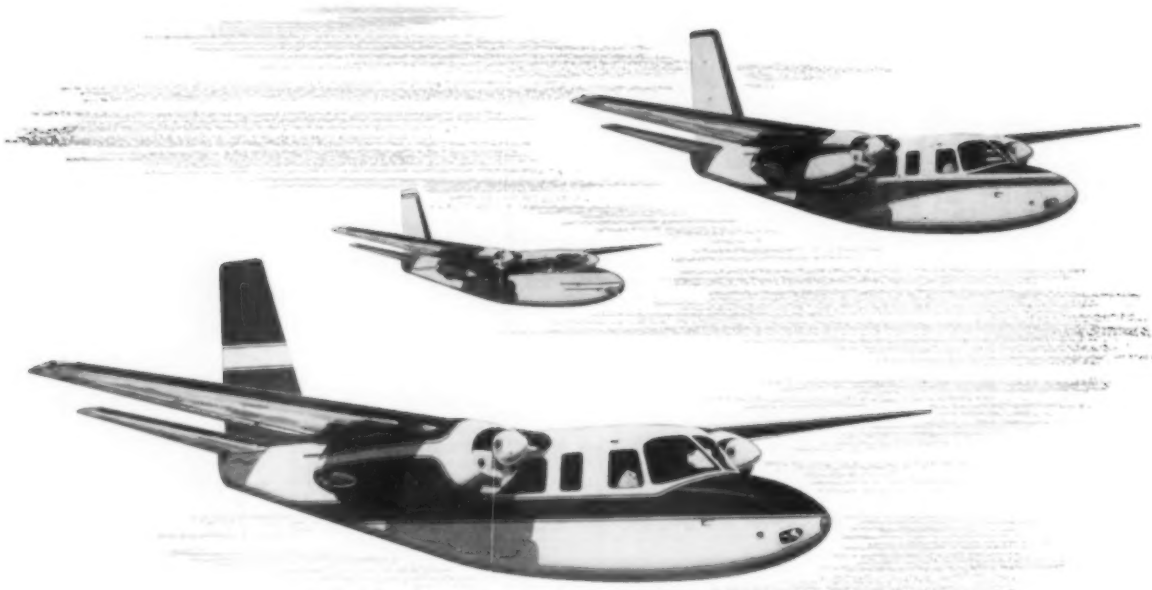

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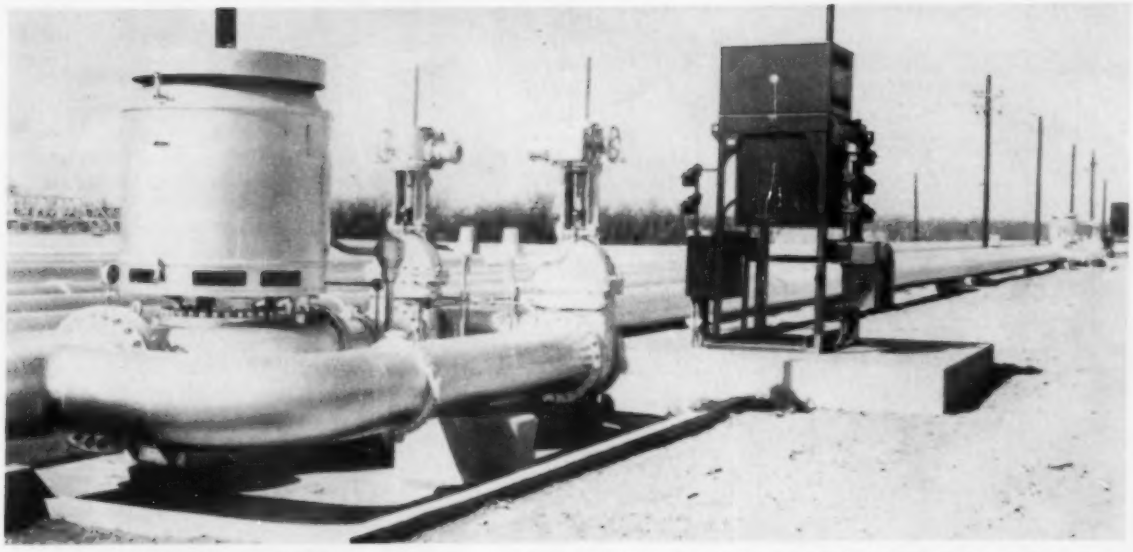


LOWER VALUES OF STATIC head above vapor pressure (NPSH) are design goals for centrifugal pumps.

What is this NPSH?

. . and what is its relation to centrifugal pump performance?

BY VAL LOBANOFF

Here's a simplified definition of NPSH

TO DEFINE NPSH, it is necessary to understand that a centrifugal pump is designed as a hydraulic machine to move liquids. The centrifugal pump cannot operate properly on either air or gases. It means that the liquid entering the impeller eye must be in the liquid form. Even liquids with entrenched gases will have unfavorable effect on pump performance. Before entering impeller eye, the liquid must overcome many barriers, such as pipe friction, hydraulic shock loss, prerotation, and velocity head. To keep liquids from boiling at the impeller entrance, a sufficient static head, above vapor pressure, must be provided to overcome the losses or barriers. This static head above vapor pressure is called **NPSH, or net positive suction head.**

NPSH DEPENDS on many variables, which variables add to the complexity of determining NPSH. They are as follows:

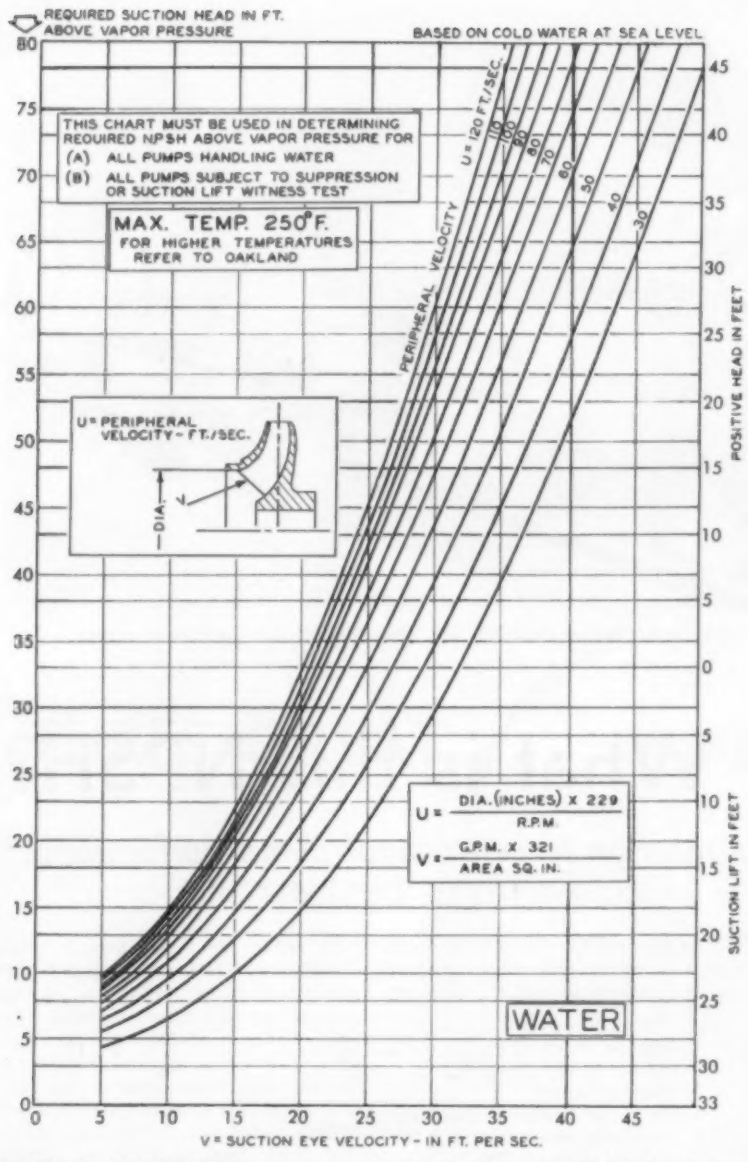
1. Specific speed (Ns)
2. Operating speed (r.p.m.)
3. Pumped liquid
4. Design of a suction approach
5. Pumping temperature (°F.)
6. Suction pressure (Ps)
7. Viscosity and specific gravity
8. Impeller eye area (sq. in.)
9. Design of an impeller vane at the entrance (or impeller eye)
10. Velocity relative to the shaft (V)
11. Velocity relative to the vane (W)
12. Peripheral velocity at the eye (U)
13. Prerotation (u)
14. Size of the shaft

For so many variables, it can be seen that setting up a formula for determining the exact value of the NPSH is quite a difficult problem. However, as a result of very extensive study and experimental work conducted by hydraulic engineers, the determination of NPSH can be accomplished very accurately, when the pumped liquid is water. Our approach for determining required NPSH for liquids other than water is not very scientific. We depend on limited experimental data, to establish reducing factor from water to oil NPSH. I believe that this factor will vary with each pump manufacturer, and I also strongly believe that this correction factor between water and oil NPSH should be established by petroleum industry rather than pump manufacturers.

We use two methods to predict required NPSH for a given capacity. One is to calculate peripheral and relative velocities at the impeller eye, the ratio of those velocities will give the NPSH value in feet. This is shown on Fig. 1.

The second method is to calculate cavitation factor (sigma), which is equal to NPSH divided by total head per stage, also to calculate specific speed of a given pump. The ratio between the two will give required eye area. This relation is shown on Fig.

Author is chief engineer, United Centrifugal Pumps, Oakland, Calif. Paper presented at ASME Petroleum Mechanical Conference.


REQUIRED SUCTION HEAD IN FT. ABOVE VAPOR PRESSURE
BASED ON COLD WATER AT SEA LEVEL
THIS CHART MUST BE USED IN DETERMINING REQUIRED NPSH ABOVE VAPOR PRESSURE FOR
(A) ALL PUMPS HANDLING WATER
(B) ALL PUMPS SUBJECT TO SUPPRESSION OR SUCTION LIFT WITNESS TEST
MAX. TEMP. 250°F.
FOR HIGHER TEMPERATURES REFER TO OAKLAND
PERIPHERAL VELOCITY
U = 120 FT./SEC.
100
90
80
70
60
50
40
30
U = PERIPHERAL VELOCITY - FT./SEC.
DIA.
V
U = DIA. (INCHES) X 229 / R.P.M.
V = G.P.M. X 321 / AREA SQ. IN.
WATER
POSITIVE HEAD IN FEET
SUCTION LIFT IN FEET
V = SUCTION EYE VELOCITY - IN FT. PER SEC.

PERIPHERAL AND RELATIVE velocities at the impeller eye are calculated to determine NPSH value in feet. Fig. 1.

2. Points to the right of each area indicate a cavitation zone; points to the left of each area indicate safe operation. Both methods are accurate for determining safe water NPSH; those values give additional safety for liquids other than water.

Another factor that enters into determination of NPSH is the ratio of average relative velocity (velocity relative to the vane) to the absolute velocity (velocity relative to the shaft). This ratio "K" should be an average of 2.85. The higher or lower values would indicate danger of cavitation.

Impeller design . . . Each impeller is designed with shockless entrance flow only at the best efficiency point, or peak efficiency. Operating a pump to the left of peak efficiency means more prerotation and increasing hydraulic shock losses; operating a pump to the right of peak efficiency means prerotation in the direction opposite to the impeller rotation and still greater hydraulic shock losses. This is illustrated on Fig. 3.

Specific speed . . . The pumps of a higher specific speed are more sensitive to cavitation than the pumps of a lower specific speed. In a given pump, a cut impeller diameter increases the specific speed.

On the basis of this theory, it is evident that selected pumps should operate as closely as possible to the peak efficiency and to full diameter, to obtain the best NPSH characteristics.

High Speed and High Suction Pressure

The high rotative speed of the pump and the high suction pressure also have their effect on a centrifugal pump and the required NPSH.

For similar operating conditions, specific speed and the cavitation constant remain the same, regardless of the running speed. Theoretically, the NPSH will vary as the square of the speed. Several tests have been conducted to determine the effect of running speed on NPSH. It has been found that NPSH does not vary as a square of the speed, but with some smaller exponent. The reasons for this may be that, at higher speeds, fewer particles of liquid have less time to absorb the necessary head to evaporate and explode, while passing through a low-pressure zone.

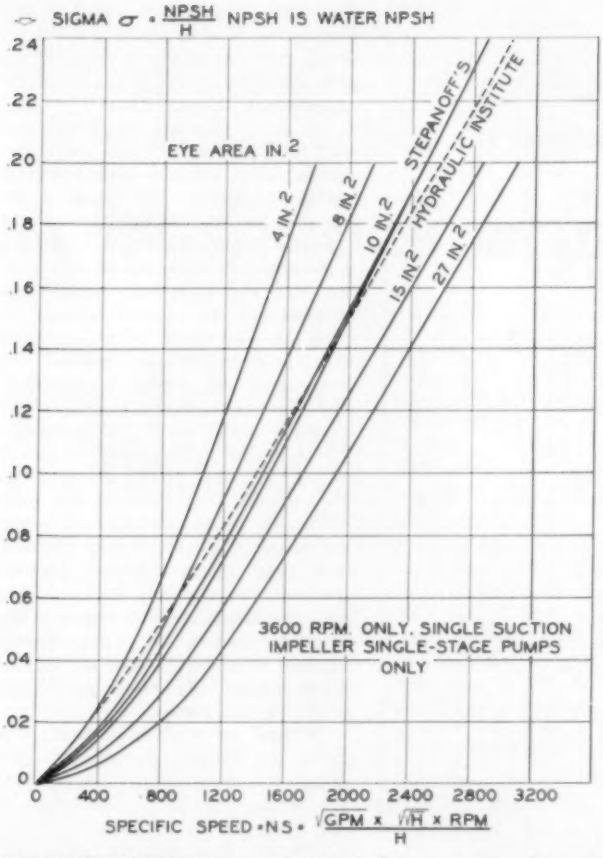
The effect of cavitation at high vapor pressure is considerably smaller than at low pressure. This is because the same amount of vapor in the liquid and in cavitation zone occupy less volume at higher pressure.

Shaft size . . . Size of the shaft has a definite effect on NPSH; larger shaft diameter increases the diameter at the impeller eye and thereby increases the peripheral velocity, which in turn will require a higher value of NPSH.

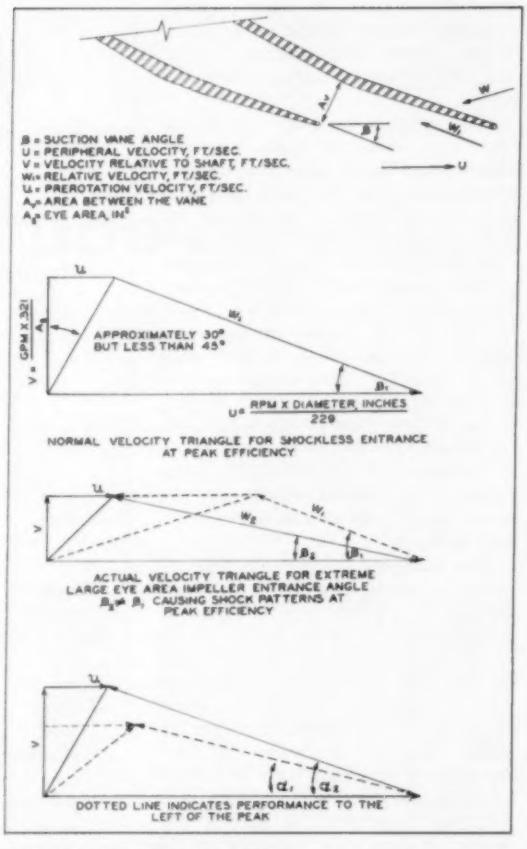
For the same specific speed and same capacity the two-stage or a multistage pump will require more NPSH than a single stage unit. This is due entirely to the larger-diameter shaft going through the impeller eye.

Viscosity effect on NPSH . . . We have very little information, theoretical or practical, on what effect the viscosity has on NPSH. However, from experience, we know that up to 2,000 S.s.U., we are safe by using water NPSH values. Above 2,000 S.s.U., we depend on an educated guess for establishment of the required NPSH.

Cavitation . . . When centrifugal pumps operate under insufficient NPSH, they start to cavitate. Cavitation is indicated by noisy operation of the pump. The degree of noise will vary with each type of pump and with each impeller in the same pump. It can appear over the full range of pump performance or at some fixed capacity. The effect of cavitation will also vary with each different type of pump or with dif-



CAVITATION FACTOR and specific speed of the pump may be used to predict NPSH. Fig. 2.



HYDRAULIC SHOCK LOSSES result when a pump is operated to the left or right of peak efficiency. Fig. 3.

ferent specific speed. For a given NPSH, pumps of low specific speed will pump up to a fixed capacity and not beyond. Depending on available NPSH, cutoff capacity can occur at any point of pump performance. This probably would happen without any cavitation noise.

A pump of medium specific speed will continue pumping with a given NPSH, but when reaching a cavitation zone, it will develop a rattling noise. The noise is due to the bursting of liquid particles when they reach low-pressure area. This explosion of liquid particles can be very damaging to the mechanical parts of the pump; on the other hand, the explosion might create noise without any effect on impeller or casing.

Pumps of high specific speed will not always cavitate with noise. The beginning of cavitation will be indicated by loss of head over the full range of capacity; but when the full cavitation zone is reached, the noise will normally become quite violent, with a damaging effect on impeller and casing material.

Piping to the pump approach . . . We feel that more attention should be paid by the pump user to the piping on the suction approach of a pump. Suction - piping arrangement is of prime importance to the pump performance. Due to the cost element, short elbows, short piping, loops in suction line, placing of valves and other fittings too close to the pump suction is a common occurrence. All those create uneven distribution of velocities, vortexes, airlocks, etc., which contribute to pump cavitation. Normally, in figuring available NPSH, only pipe and bolting friction losses are added to the required NPSH, and nothing is added to overcome hydraulic shock loss. Correct suction piping would greatly reduce difficulty normally blamed on NPSH or on poor pump design.

Application of a Booster Pump

To move oil from the tank farm to the pipeline station requires a centrifugal pump of special design. Generally, it is desired that the tanks be completely emptied, especially when the pipeline handles various products. Therefore, the booster pump must be designed with the best NPSH characteristics; this means a vertical unit of a medium specific speed and relatively low rotative speed. The booster pump operates over a wide range of capacities, in many cases with two different impellers, low and normal capicity. In designing and selecting a booster pump, these factors must be taken into consideration.

Design of a booster pump . . . When the requirements are such that the tanks must be completely emptied, a vertical "can" type of pump should be used. There are several different designs of can-type pumps that are successfully used in booster-service application.

One manufactured by the author's company is type VCD. This pump is specifically designed for the petroleum industry. It is a vertical centrifugal unit designed for medium and high capacities, medium heads, and relatively slow rotating speeds. These pumps consist of three subassemblies: nozzle head, pumping assembly, and outer barrel.

The nozzle head is either cast or fabricated, has integral discharge and suction nozzles, and integral or sep-

arate stuffing box. In many applications, the suction nozzle is furnished in the barrel. The stuffing box is adaptable to mechanical seals or packing.

The pumping assembly consists of one or a series of cases and impellers, depending upon the number of stages required for each individual job. The cases are of a diffuser design and are individually cast for each stage. The diffuser type of pump case provides pumps with a radial balance. The impellers are enclosed type, axially balanced by means of the same diameter wearing rings on both sides of the impeller. This design permits the use of a normal thrust bearing in the motor. Due to the light loads the bearing life in the motor is greatly extended. For protection against surges it is recommended that the motor bearing be locked for momentary upthrust.

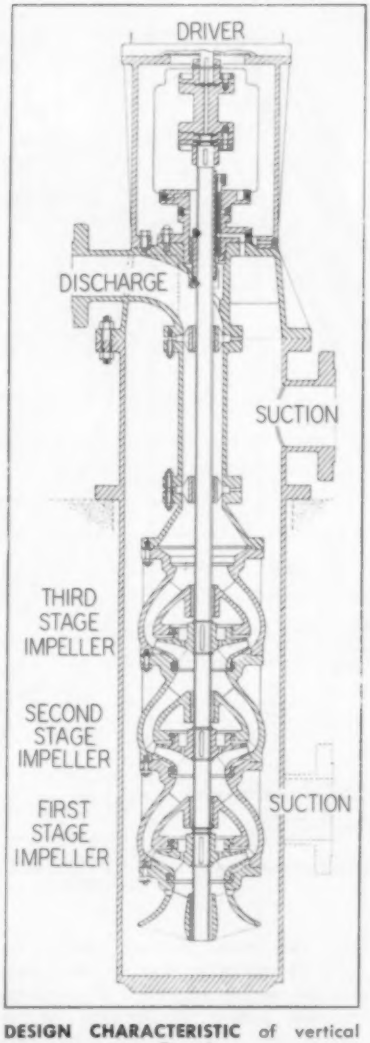
The pumping assembly is held together by bolting at the individual case flanges. The upper case is bolted to a discharge column or directly to the nozzle head, depending on the pump setting. The outer barrel is fabricated and is made long enough to provide sufficient NPSH to the first-stage impeller. This type of a pump will operate without cavitation with "0 NPSH" at the suction nozzle.

When a mechanical seal is furnished, it should be mounted on the independent shaft sleeve, to facilitate servicing of the seal.

The coupling is a rigid type with spacer and adjustable plate. The spacer should be long enough to allow removal of seal shaft sleeve. Adjustable plate is furnished for the ease of setting the rotating element in its proper position. The clearance between the rotating and the stationary parts should be nominal, 0.010-in. diameter between case and impeller rings and 0.008-in. maximum diameter between bushings, bearings, and shaft. Excessive clearances might cause the vibration or shaft whipping. Galling materials between the stationary and the rotative parts should be avoided. The general design characteristic is shown on Fig. 4. To prolong the life of this pump and to have successful operation, the alignment between the motor and the pump should be held very close (not over 0.001 in.). This alignment is much more critical on the vertical pumps than on horizontal units.

In-Line Pumps

When the level in the tank is not so critical, such as in many floating-roof tanks, then the can-type pump is not commercially justified. A vertical IL (in line) type of pump usually fulfills all necessary service requirements at reduced cost of purchasing and installation. As manufactured by the author's company, the IL pump is a vertical, volute-type, single or double-suction impeller, centrifugal unit.



DESIGN CHARACTERISTIC of vertical can-type pump. Fig. 4.

The pump case is designed with suction and discharge nozzles on the same vertical and horizontal center lines located 180° apart. The suction and discharge are normally of the same size, for simplicity of piping. This construction also eliminates pipe strains. IL-type pump, with sizes up to 12 in., is designed without supporting feet and a foundation under a pump case is not required. It can be installed in the pipeline in the same manner as a valve.

Due to the weight and size, pumps over 12 in. are also furnished without supporting feet, but a foundation under the pump case is necessary. The pump case is not bolted to the foundation, and is allowed to move in the direction of pipe stresses. Pump and driver move as a unit without causing any misalignment.

The single-suction impeller has back-to-back wearing rings, giving hydraulic axial balance under normal suction condition. The standard design has an impeller mounted on the extended driver shaft and no coupling is required. Several modifications of the IL pump have been successfully adapted for the booster service.

In the area where flood conditions exist, extended bracket between the pump and the driver is furnished. The same construction is used where piping is underground. The pump casing is buried underground to match piping, but the driver mounted on the extended bracket is aboveground.

The IL pump has separate pump and motor shafts. It is also furnished with rigid, spacer-type coupling, to facilitate the removal and servicing of a mechanical seal. Another pump of this type, the DSIL, has a double suction impeller. It has all of the other design characteristics of the single suction pump.

Because of a double-suction impeller, the NPSH requirements of this pump are lower, and it is designed for higher capacities. The length of the shaft on the pump end dictates a separate shaft between pump and the driver.

Cases of the IL and DSIL pumps are always furnished in cast steel with heavy metal section and heavy bolting to prevent case bursting due to the pipeline surges. These pumps are designed in the best specific-speed range. They are highly efficient, and have good NPSH characteristics.

Conclusion

Any application, where available NPSH is low, presents a problem to a design engineer. No definite rules or standards can be given or established. Each application must be treated as a special problem, with the final selection of a particular design depending upon careful evaluation of various factors involved.

Many hydraulic engineers today, in universities and industry, are working on solving all mysteries related to NPSH.

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3. "Cavitation Versus NPSH Requirements," by L. H. Garner, Petroleum Refiner, August 1954.
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REFINING

100-octane gasoline and high-quality distillates cause refiners to pause and take . . .

A fresh look at crude-oil values

BY NELLSON R. ADAMS and RALPH C. KERSTEN

REFINERS will find it profitable to take a closer look at the values they fix on the crude oil stocks they process. Crude prices may be expected to go up in the not-too-distant future.

- The time-honored practice of evaluating a crude for refining purposes principally on the basis of its API gravity alone is unsatisfactory in the light of current and foreseeable economic facts. An engineering study can be as appropriate to crude evaluation as it is in determining the optimum processing scheme for the modern refinery.

- Proper selection of crude and processing equipment offers opportunities for competitive advantages at today's increasingly complex level of refining operations, cost differences when processing alternative crude oils in the same process equipment may be as high as 20 cents per barrel. Proper selection of modern equipment to process a given crude oil may result in almost double refinery earnings.

- Maintaining competitive position in the face of higher and higher crude prices and rising processing costs demands increasing attention to economics and today's critical components—sulfur and hydrogen. Inefficient processing means dollars lost. Therefore, more technical attention must be given to these problems today than has been done in the past.

Authors are with Universal Oil Products Co. at Des Plaines, Ill. Paper presented at Southwest regional meeting of American Chemical Society, Tulsa,

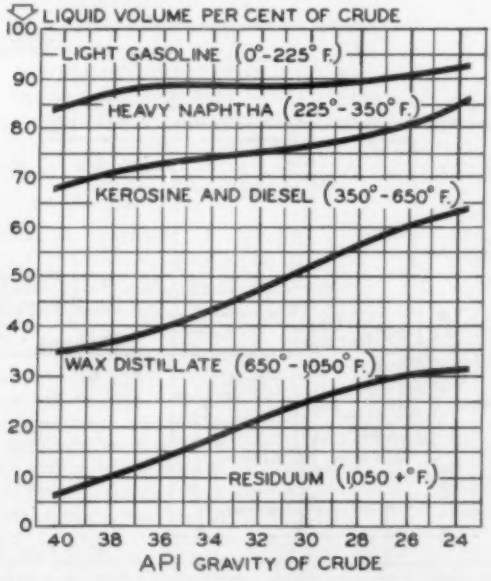
Crude Prices to Go Up.

The belief that crude-oil prices are s ated to rise in the near future is logical simply because crude-oil production costs[1] have risen more rapidly than have crude-oil prices since World War II. These costs have soared as the result of increased wildcatting and the greater depth of wells found necessary to produce proved areas—coupled with the higher wage and material costs that have been sustained by industry in general.

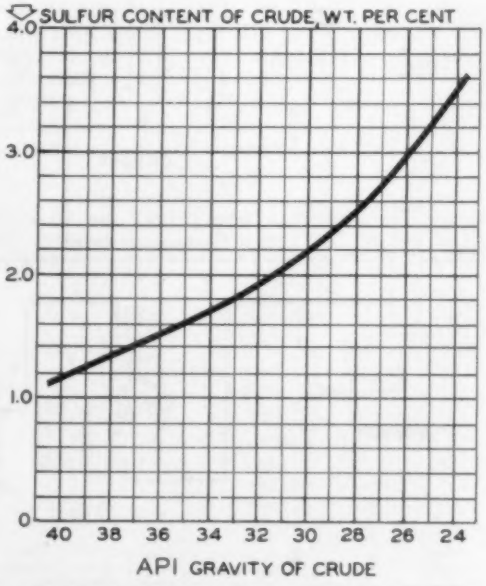
These factors will inevitably affect crude-oil prices substantia ly. Since it is just good business not to sell a barrel of oil for less than its replacement cost, the question is: "When will crude prices go up?"; not "Will they go up?"

More careful evaluation . . . Refiners will be forced to live with these increased raw-material costs. As the crude prices advance, however, it becomes increasingly important that the refiner weigh more carefully the characteristics of the crude, from the point of view of obtaining the maximum value for his money, and determining the processing scheme best suited to his needs.

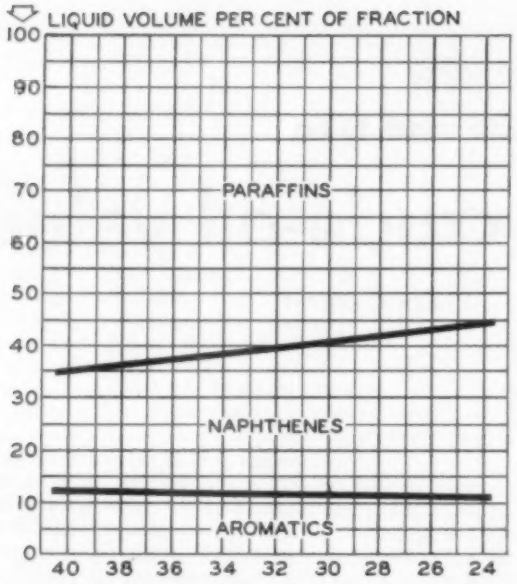
High octane and low sulfur . . . This presentation is intended to focus attention on some of the trouble-spots in the refiner's future and also to emphasize the importance of efficient engineering appraisal of these problems. Attention will be centered on



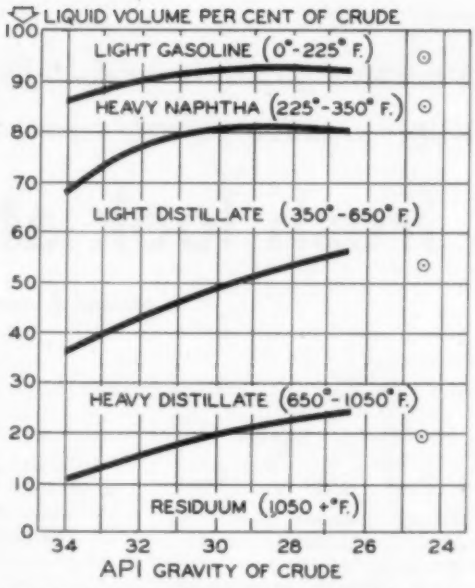
ANALYSIS by distillation, Middle East crude oils. Fig. 1.



SULFUR CONTENT, Middle East crude oils. Fig. 2.



HYDROCARBON-TYPE ANALYSIS, 225°-350° F. fraction, Middle East crude oils. Fig. 3.

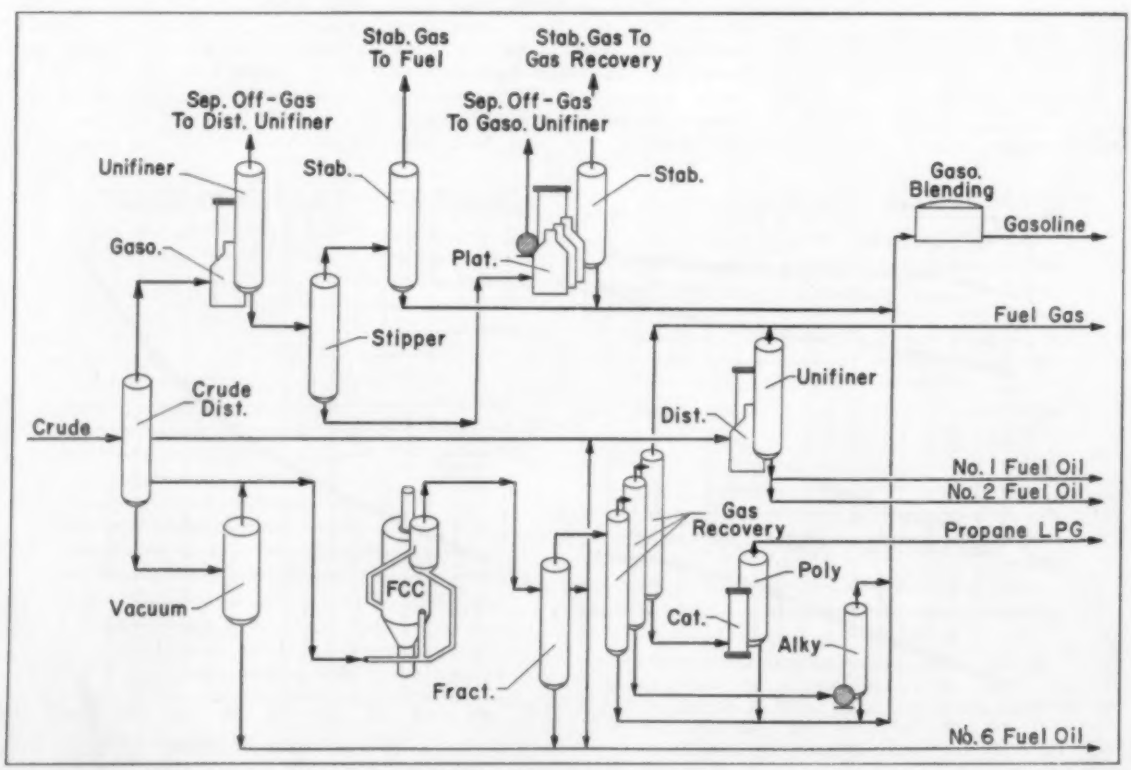


YIELDS OF CRUDE OILS of varying gravity from the same producing area (Venezuela). Fig. 5.

the profitability of crude oil selection and the impact of high octane gasolines and low sulfur heating oils on refinery economics. A new appreciation of the role of sulfur and hydrogen as today's crtical components in this era of higher crude costs will be evidenced; first, in the production of high octane motor fuels and, second, in the manufacture of low sulfur distillates.

Evaluating Crude Oils

In the past, the API gravity has been used as the sole criterion of value in the pricing of crude oils. Historically, the lower-gravity crudes were priced lower than the higher-gravity materials. The usual practice assigned a specific price to, say, 20° gravity and below, and established a certain price differential for each successively higher degree to a top value for, say, 40° gravity and above.



SIMPLIFIED refinery flow diagram. Fig. 4.

This practice came about as a result of the natural limitations of early-day refining practices. In those days, when the "gasoline buggy" was still being greeted with raucous yells of "Better get a horse," the lighter hydrocarbons were by far the most valuable portion of a crude oil and the heavier materials were wastefully burned or dumped in the nearest creek. The API gravity adequately described the refining value of a crude oil. This historic practice persists even today.

Times have vastly changed since then. While the lighter hydrocarbons still are the most valuable end of the crude, dollar-wise, the heavier hydrocarbons now have a much greater value in midcentury refineries. The API gravity thus may no longer be considered the only standard in evaluating crude oil from widely separated producing areas, or even a very useful criterion for this purpose.

A more realistic method . . . This consists of assigning practical values to crude oils—regardless of their origin or gravity—based on their content of certain hydrocarbon fractions and taking into consideration the sulfur content and availability of hydrogen for other processing requirements, such as desulfurization or virgin and cracked naphthas by hydrogen treating. It may, or may not, correlate readily with API gravities. This evaluation can be readily expressed as a function of the summation of the individual values of four basic fractions; namely, virgin gasoline (IBP-350° F.), middle distillate (350-650° F), heavy distillate (650-1,050° F.) and residue (above 1,050° F.).

Having pointed out that API gravity alone is a very treacherous criterion of crude-oil value, it is appropriate nevertheless to start with the single known exception which proves the rule—the Middle East producing area—simply to become oriented for the rude shock which comes later on.

Middle East Crudes

Distillation analyses of various Middle East crude oils which exhibit a marked pattern on the basis of the four fractions described are presented in Fig. 1. If one were to equate the value of each of the crudes at each of the API gravities indicated, it will be found that the value of the products obtained will, for these particular crudes, vary almost directly with crude-oil gravity.

Since the deleterious effect of sulfur compounds upon the tetraethyl lead susceptibility of gasolines has been too voluminously documented by other authorities to need further proof of validity here, and marketable distillate products have extremely rigid sulfur specifications, the natural sulfur content will be found to have a considerable influence on the cost of processing a given crude oil.

Sulfur vs. API . . . To illustrate the economic significance of sulfur compounds, the sulfur content of the same Middle East crudes shown in Fig. 1 have been plotted versus API gravity. The result is shown in Fig. 2. Here it will be noted that the desirability of these Middle East crudes from the standpoint of sulfur content also correlates directly with API gravities.

When the physical and chemical properties of the basic fractions from Middle East crude oils are studied, it will be apparent that these properties likewise correlate with API gravity of the crude. However, the value of the crude oils based on these physical and chemical properties does not necessarily increase with API gravity.

Cat reform stock . . . The hydrocarbon-type analyses of the catalytic-reforming charge-stock fractions (225°-350° F.) of Middle East crude oils are a case in point. It can be seen readily from Fig. 3 that the proportion of cyclic compounds in the fractions obtained from the lower API Middle East crude oils are much greater than the corresponding proportion of cyclics available in the fractions obtained from the higher API gravity crudes. This means, therefore, in catalytically reforming the naphtha portion from these two crudes at constant octane level, that a substantial yield advantage is indicated when using the naphtha obtained from the lower-gravity crude.

However, it is only fair to say that this effect, either alone or together with other physical or chemical properties to hydrocarbon type or paraffinicity, is sufficient to alter the earlier conclusion that the value of a Middle East crude is directly related to its API gravity. But here this generalization ends.

Other Producing Areas

A comparison is shown in Table 1 for 31°-API gravity crude oils from two widely separated producing areas to illustrate this point. The differences between the two oils are evident. Additional comparisons at various API gravity levels reveal that one may expect wide differences in the proportions of each of the four basic crude fractions at constant crude gravity. Comparative evaluation of crude oils from widely separated producing areas—based on gravity alone—is thus manifestly impossible.

Proper Selection of a Crude

Proper selection of a crude oil based on its physical characteristics and the efficient processing of that crude in modern equipment has a far greater effect on refinery earnings than does purchase of a particular crude solely on the dictation of a price-gravity relationship.

Crude oils of equivalent API gravity . . . To compare economically the relative value of crude oils of constant API gravity, two crudes have been selected which display much less dissimilarity than the example shown in Table 1. The yields and properties of the specific 31°-API gravity crude oils used in the evaluation are shown in Table 2.

The two crudes were processed in the modern refinery shown schematically in Fig. 4. In it we have assumed processes offered by Universal Oil Products Co. because of our familiarity with them. This refinery contains the usual processing equipment to be expected in a plant of its type, as follows:

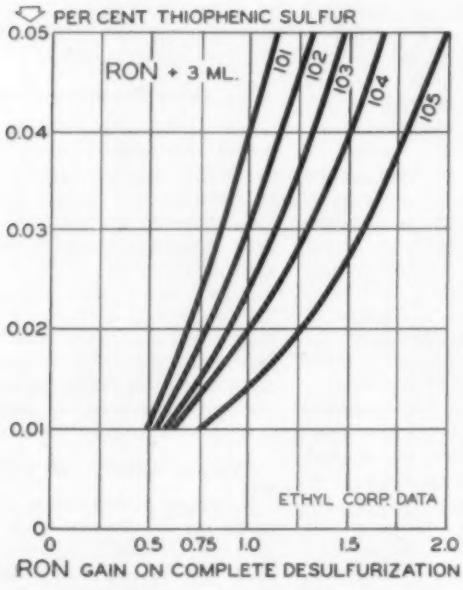
Crude and vacuum distillation
Fluid catalytic cracking
Unifining—Platforming
Catalytic polymerization

TABLE 1—COMPARISON OF 31° API CRUDE OILS FROM TWO PRODUCING AREAS

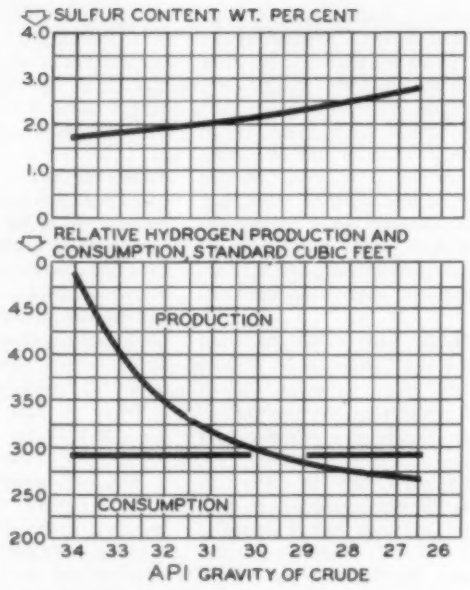
Crude-oil source:	Middle East	Ecuador
Gravity, °API	31.2	31.2
Sulfur, wt. per cent	2.00	0.12
Basic fractions, crude vol. per cent:		
0°-225° F.	10.5	3.3
225°-350° F.	14.0	20.7
Paraffins, vol. per cent	60	27
Naphthenes, vol. per cent	28	68
Aromatics, vol. per cent	12	5
350°-650° F.	25.5	40.0
650°-1,050° F.	27.5	31.0
1,050+ °F.	22.5	5.0

TABLE 2—YIELDS AND PROPERTIES OF SPECIFIC CRUDE OILS, 31° API GRAVITY

Crude-oil source:	Middle East	Venezuela
Gravity	31.2	31.0
Sulfur, wt. per cent	2.00	1.48
Basic fractions, crude vol. per cent:		
0°-225° F.	10.5	9.2
225°-350° F.	14.0	11.0
Paraffins, vol. per cent	60	55
Naphthenes, vol. per cent	28	31
Aromatics, vol. per cent	12	14
350°-650° F.	25.5	33.7
650°-1,050° F.	27.5	28.8
1,050+ °F.	22.5	17.3



ADDITIONAL RON possible upon desulfulization of 100-plus RON gasoline at 3 ml. TEL per gal: Fig. 6.



SULFUR CONTENT and hydrogen consumption. Fig. 7.

HF Alkylation
Distillate Unifining.

Comparative economics . . . These, exclusive of depreciation, interest, and income taxes, are shown in Table 3. These data indicate that refinery net operating profits may vary as much as 20 cents per barrel of crude charge, despite the minor yield and property differences shown for crude oils in Table 2. This differential would amount to about $1,800,000 per year —gain or loss—in a refinery having an average daily throughput of 25,000 bbl.

It should be mentioned that the price structure utilized in the economics presented in Table 3, as well as those presented later, are considered "typical" of the Eastern seaboard. The basis is 0.5 cent per gallon over Platt's Gulf Coast low-weighted average prices for the first half of 1957 for all products except propane and butane. In the case of propane LPG, New York harbor tank-car prices were used, in which butane was valued at 1.0 cent per gallon over propane price. Premium gasoline of 102 octane number was valued at 2.5 cents per gallon over 95 octane, Gulf Coast price. A crude-oil price of $3 per barrel, delivered, was assumed for all crude considered in this study in order to simplify the pointing out of obvious discrepancies in pricing crudes with the API gravity as the prime criterion.

Varying API Gravity

The yields of the basic fractions of four crudes from the same producing area, but having different API gravities, are presented in Fig. 5. It is apparent that these crudes do not follow the pattern of the Middle East crude oils. It should be noted, however, that three of the four do follow a fixed pattern, indicative of the particular area from which they come, and are quite unlike crudes from this same field which follow no particular pattern—as indicated by the fourth crude (24.5° API) plotted.

Naphthenes and aromatics of the 225°-350° F. fraction of these crudes (not shown in Fig. 5) total 55 and 48 volume-percent for the 34° and 26.5° API crude oils respectively. In contrast, the nonconforming crude oil's Platformer charge fraction contains 70 volume-per cent naphthenes plus aromatics.

The economics of processing these four crudes are shown in Table 4. The economic results of the three crudes forming a pattern are consistent with past studies of this subject, namely, greater net refinery earnings will accrue from processing the higher gravity crude oils. However, the economics of processing the dissimilar crude (24.5° API) shows that its true value is much greater than its gravity would indicate and that it possibly may be worth more than the 31° API crude oil.

Proper Process Equipment

In Table 3, a Middle East and a Venezuelan crude oil are used to demonstrate that crude of equivalent API gravities may have a considerably differing effect on refinery earn-

TABLE 3—ESTIMATED NET OPERATING PROFIT, 31° API CRUDE OILS

		—Middle East—		—Venezuela—	
Value of products:	$/bbl.	Yield, vol. %	$/bbl.	Yield, vol. %	$/bbl.
Gasoline	6.55/5.55	48.8	2.98	51.8	3.13
Fuel gas	2.93 (FOE)	4.0	0.12	3.9	0.11
C_3 LPG	4.10	3.4	0.14	3.2	0.13
C_4 LPG	4.52	0.5	0.02		
No. 1 fuel oil	4.53	9.7	0.44	13.8	0.63
No. 2 fuel oil	4.38			3.5	0.15
No. 6 fuel oil	2.93	32.9	0.96	24.7	0.72
Total			4.60		4.87
Less 1 per cent handling loss			0.05		0.05
Total value of products			4.55		4.82
Cost of charge stocks:					
Crude oil	3.00	100.0	3.00	100.0	3.00
Purchased butane	4.52	0.1	0.01	1.3	0.06
Gross profit			1.54		1.76
Operating expenses			0.81		0.82
Net operating profit			0.73		0.94

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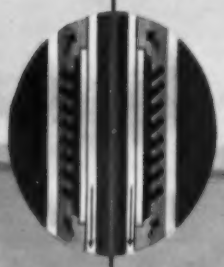
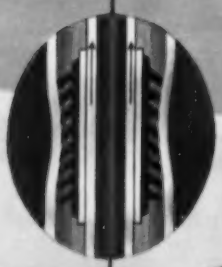


1. FREE FALLING

On the down stroke, clearance between fins and pipe allows swab to fall free.



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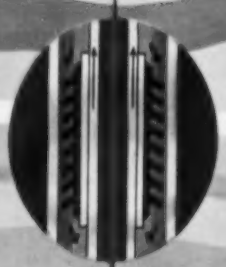
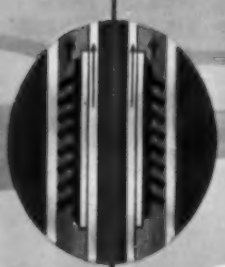


3. RELEASES OVERLOADS

When load is excessive, fins bend down to bypass excess fluid. This safety relief action prevents overloads and broken wire lines.



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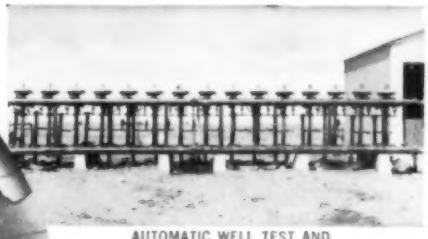

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ings. However, proper selection of modern refinery equipment also affects refining earnings markedly.

Since one manifestation of crude-oil dissimilarity is that crude oils of equivalent API gravity from different producing areas may have a greater quantity of 1,050+° F. residuum, an increase in refinery earnings may be affected by taking advantage of this less desirable component by coking the heavy-crude residue.

Table 5 shows the earnings of our "typical" refinery when charging the 31° API Middle East crude, with and without coking the heavy-crude residue. The processing plan is identical to Fig. 4 in each instance with the exception that coking and sulfur production have been added in the latter case. Although some 20 cents per barrel less earnings were attributable to this crude oil without coking as compared with another crude oil of the same API gravity (Table 3), it can be seen from Table 5 that earnings of 57 cents per barrel, or about $5,200,000 per year for a 25,000-bbl. per calendar day refinery, are indicated when coking and sulfur production are added.

This almost doubles the refinery net operating profit. It is apparent from Table 5 that the sulfur-plant addition does not greatly affect refinery net operating profit and that coking of the crude residue is primarily responsible for the increased earnings.

TABLE 4—ESTIMATED NET OPERATING PROFIT VARYING API GRAVITY FROM SAME PRODUCING AREA

	$/bbl.	34.0 $/bbl.	31.0 $/bbl.	26.5 $/bbl.	24.5 $/bbl.
Value of products:					
Gasoline	6.55/5.55	3.70	3.13	3.02	3.20
Fuel gas	2.93 (FOE)	0.15	0.11	0.10	0.11
C_3 LPG	4.10	0.09	0.13	0.11	0.09
No. 1 fuel oil	4.53	....	0.63	0.49	....
No. 2 fuel oil	4.38	0.78	0.15	....	0.76
No. 6 fuel oil	2.93	0.42	0.72	1.03	0.82
Total	....	5.14	4.87	4.75	4.98
Less 1 per cent handling loss	....	0.05	0.05	0.05	0.05
Total value of products	....	5.09	4.82	4.70	4.93
Cost of charge stocks:					
Crude oil	3.00	3.00	3.00	3.00	3.00
Purchased butane	4.52	0.09	0.06	0.10	0.18
Gross profit	....	2.00	1.76	1.60	1.75
Operating expenses	....	0.85	0.82	0.78	0.77
Net operating profit	....	1.15	0.94	0.82	0.98

TABLE 5—ESTIMATED NET OPERATING PROFIT, 31° API MIDDLE EAST CRUDE OIL

		Without coking		With coking	
Value of products:	$/bbl.	Yield, vol. %	$/bbl.	Yield, vol. %	$/bbl.
Gasoline	6.55/5.55	48.8	2.92	62.0	3.76
Fuel gas	2.93 (FOE)	4.0	0.12	6.5	0.19
C_3 LPG	4.10	3.4	0.14	4.9	0.20
C_4 LPG	4.52	0.5	0.02	0.5	0.02
No. 1 fuel oil	4.53	9.7	0.44	10.2	0.46
No. 2 fuel oil	4.38	....	....	10.4	0.46
No. 6 fuel oil	2.93	32.9	0.96	2.2	0.06
Sulfur	*30	....	....	†26	0.03
Coke	*10	....	....	†334	0.13
Total	....	....	4.60	....	5.31
Less 1 per cent handling loss	....	....	0.05	....	0.05
Total value of products	....	....	4.55	....	5.26
Cost of charge stocks:					
Crude oil	3.00	100.0	3.00	100.0	3.00
Purchased butane	4.52	0.1	0.01	0.4	0.02
Gross profit	....	....	1.54	....	2.24
Operating expenses	....	....	0.81	....	0.94
Net operating profit	....	....	0.73	....	1.30

*Dollars per ton. †Tons per day.

Sulfur and Hydrogen Are Critical

How a refiner can get more octane in the 100 range has been answered just recently.[2]

Complete desulfurization of gasoline-blending components has been found feasible and economically attractive. Therefore, complete removal by means of the Unifining process will result in a direct octane boost by increasing TEL response.

This is illustrated in Fig. 6 by the increase in research octane number possible with complete desulfurization of 100-plus-octane gasoline at 3.0 ml. TEL per gallon. These data indicate that as little as 0.05 weight per cent thiophenic sulfur in a 105-octane-number gasoline will result in the loss of as much as two octane numbers, due to sulfur-TEL antagonism. As you know, most gasolines have a 0.1 weight per cent sulfur specification and many are marketed having greater sulfur contents than strict adherence to the specification would allow.

Although various refiners have different octane-cost scales, the price of octane improvement today is high for all refiners. This should present sufficient incentive to the refiner to take a long look at Unifining as a means of attaining increased gasoline quality.

Hydrogen availability . . . Closely allied to the problem of sulfur removal by Unifining is hydrogen availability. Hydrogen production by Platforming increases rapidly with API gravity of crude oil, in most cases, due to the greater quantity of charge material contained in the crude. This is shown in Fig. 7. These are general figures based on the "typical" refinery assumed for illustration. Hydrogen production in commercial operations can, of course, be varied as a consequence of the particular process conditions chosen, but not over a wide range.

Conversely, although some discrepancies are noted, hydrogen consumption in Unifining both naphthas and distillates from the whole crude generally remains relatively constant as crude API gravity varies. This is primarily due to the fact that although sulfur content of the basic fractions increases with the crude gravity, the volumes of naphtha and distillate to be desulfurized decrease substantially as crude gravity decreases, thus compensating for the higher sulfur contents. From Fig. 7, therefore, it is apparent that sulfur and hydrogen are today's most critical components in the production of high-octane motor fuels and specification distillate oils.

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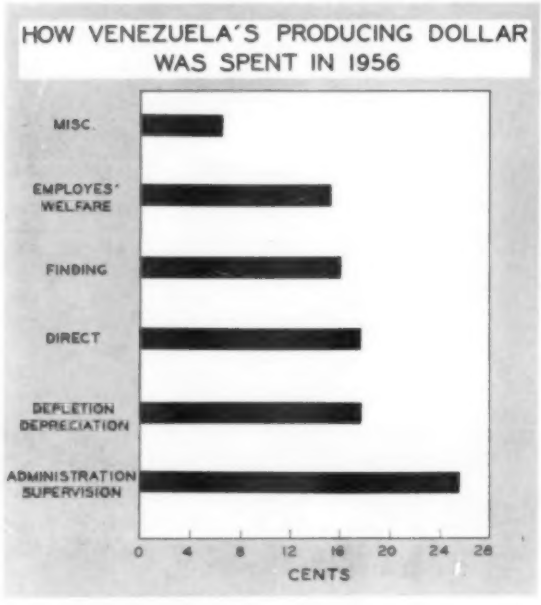
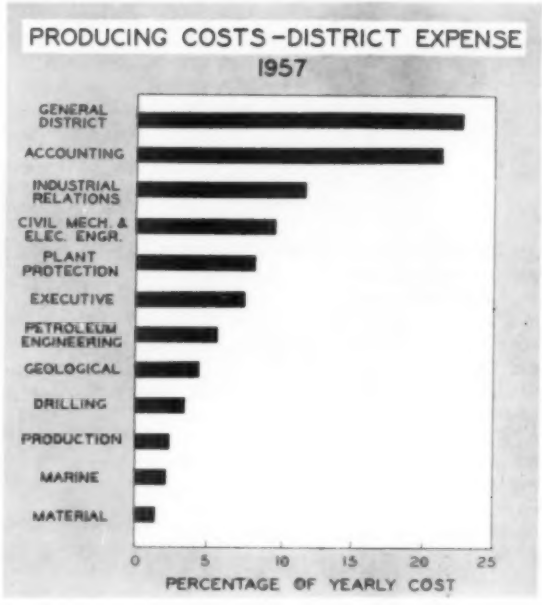
1. "America's Biggest Bargain," W. L. Baker and C. W. Smith, Pet. Refr. Sup., March 1957.
2. "What Sulfur Means to 100-Octane Fuels," G. H. Unzelman, Pet. Proc., June 1957.

Part 2 **VENEZUELAN KNOW-HOW**





Production practices in Venezuela

are based on bigger volumes than those in U. S.

BY HARRY L. FRANKLIN and W. DOYLE MILLER

PRODUCTION PRACTICES in Venezuela on land areas compare very favorably with the best in the United States. The only major difference between the two practices is that of fiscalization (official gaging, by Venezuelan Government representatives) of the crude. Generally, production is gathered at tank batteries which are mainly used for dewatering, testing, and degassing the production. It is then, generally, shipped to tank-farm terminals where fiscalization is done in the presence of the "Hydrocarburo" representative.

Government royalties are calculated at the fiscalization point. Since this is done after gathering from several producing areas, the tank farms are usually quite large and must be so because of the practices required by the government. Storage must also be provided for several days' production since in the case of land areas, deep-sea terminals are usually quite some distance from the fiscalization points.

Producers entering Venezuela for the first time thus become much more closely associated with oil handling and terminaling than they do generally in the United States, and close coordination between the producer and the shipper must be maintained at all times.

In the Lake Maracaibo producing areas the practices are very similar to those on land; however, special comment is necessary with respect to the tank batteries, commonly called "flow stations." Because of the fact that these flow stations are extremely costly ($600,000) and are built on platforms in the water, large volumes of production are passing through quite small facilities where short-time testing and efficient handling of the crude must be done.

Flow stations, in many cases, with only four or six 1,500-bbl. tanks with complementary separator and gas-venting equipment, handle as much as 60,000 bbl. of oil per day. Because of this fact, "running gages" is all that is possible to obtain for the testing of wells. With the advent of better pipe-protection practices, it is usually possible in the case of the newer flow stations being constructed in the lake, to close in all wells there which are tied into them, rather than at the individual wells. This has not been possible, other than in recent years, due to the fact that gathering lines would not stand the closed-in pressure because of excessive corrosion of the brackish waters of Lake Maracaibo.

Extreme precaution must be taken to refrain from polluting Lake Maracaibo waters. The governmental agencies police the waters extensively,

This is the second and concluding article by the authors, based on their recently completed report, "Operating Requirements, Techniques, and Procedures for Prospective Oil and Gas Operators in Venezuela." The report, which consists of the main volume and six supplements, is being sold to oil companies interested in entering Venezuela. The first article appeared in last week's issue.

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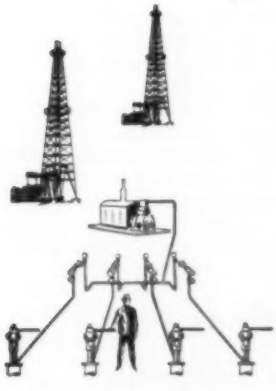

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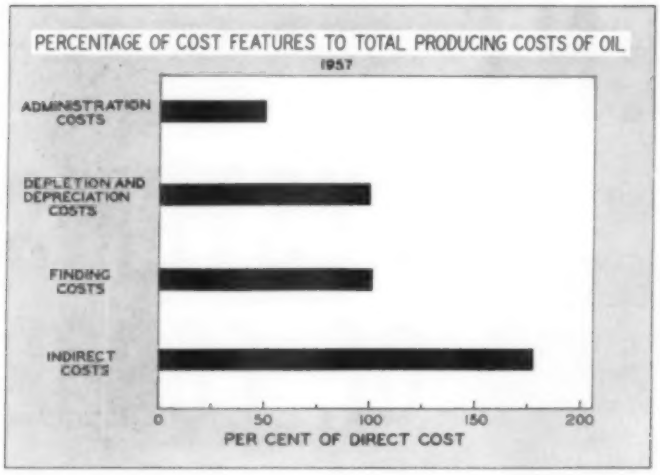

VENEZUELAN KNOW-HOW

"Producing costs have varied considerably since the end of the war. Production has increased from 323 million barrels annually to over a million barrels, or 237 per cent, while producing costs rose to a high of around 80 cents per barrel in 1949, and are now running at about 44 cents."

mainly in behalf of the fishermen who make their livelihood by fishing in the fresh waters of the lake. Strict attention must be given to this costly problem as high-rate production is obtained in the water-covered areas. In some cases producers are spending large sums on lake and land facilities to eliminate polluting hazards. The new operator must be aware of this problem and its attendant expenses.

Further, to anticipate expenditures beyond those actually required to produce wells, the new operator must also be apprised that the producers who have been operating on Lake Maracaibo for many years have been participating in a "diking" program along the eastern shores of Lake Maracaibo. This is required because of the subsidence of the land on shore and in the lake, and the dike offers protection to the land facilities near the lake shore. A new producer can expect to participate in this extremely costly operation.

Another factor which must be investigated thoroughly is that of obtaining land, especially on the eastern shores of Lake Maracaibo, for land operating facilities in connection with lake production. The land, generally, is owned in fee by the Venezuelan Oil Concessions, Ltd., and is also extremely congested with producing facilities as well as housing and facilities for people working for or catering to the oil business. Land is very scarce, costly, and in most cases must be negotiated for directly with VOC.

Deep-sea terminaling . . . Deep-water facilities are usually not available in the area south of the city of Maracaibo. Waters adjacent to the shore line are very shallow and, in fact, generally it is even necessary to do considerable dredging to operate the small craft required for producing operations at the shore line.

Equipment for Crude Dehydration

Considerable crude production currently is being subjected to thermochemical and electrical dehydration in both eastern and western Venezuela as well as in those fields in the State of Guarico located rather centrally in Venezuela. Naturally as time goes on, with steady withdrawal from reserves and consequent water intrusion in many producing horizons, larger percentages of the crude production will

Some typical cost figures in Venezuelan operations

. . . for drilling equipment

Drilling barges	180 by 70 by 11 ft.	$10,000
Draw works	600 hp.	149,000
Drill pipe	5-in.	*$7.00
Drill pipe	4½-in.	*$6.30
Drill pipe	3½-in.	*$5.00
Drill collars	6 to 8-in.	$2,000
Drill collars	3 to 4¾-in.	900
Crown blocks	350-ton	7,500
Traveling blocks		8,500
Swivels	500-ton	4,200
Drilling hooks	350-ton	5,000
Kelly joints	3½ to 5¼-in. Hex.	2,200
Blowout preventers	12-ft. double ram	16,000
Blowout preventers	12-in. Hydril	10,000
Air casing tongs		8,000

*Per foot.

. . . and for producing equipment

	Land Area	Lake Area
Flow Stations:		
Foundation—Single Deck (four tank)	$30,000	$250,000
Equipment—Single Deck (four tank)	160,000	297,000
Production Derricks	4,400	6,150
Flow Lines:		
3-in.	1.10/ft.	1.60/ft.*
to	to	to
6-in.	2.20	4.65*
Gatherine Lines:		
6-in.	4.80	5.10*
to	to	to
16-in.	9.00	14.50*
Pumping Installations	17,000	13,200
Gas Lifts	3,000	4,000

*All Lake lines asphalt-coated.

Here are some detailed cost figures for Venezeulan drilling . . .

Contract drilling, Anaco area field wells

Contract drilling costs (10-well average depth 6,300 ft.):	
Drilling at $8.50 per foot	$53,830
Coring—two rig days	2,400
Completing and testing—8 days	10,000
Fishing	2,000
Third party services	1,280
Total payment to contractor	$69,510
Company costs:	
Location preparation:	
Roads	$3,300
Clearing, grading, pits, foundation	3,500
Derrick erection	2,400
Drilling equipment:	
Bits	4,000
Coring equipment	300
Transportation, rig move	4,200
Water	1,100
Tangibles and cement	30,000
Drilling-mud chemicals	2,000
Drilling-mud additives	6,000
Third party services	10,000
Total company cost	$66,800
Total cost per well	$136,310

Workover operations, Lake Maracaibo

Type of workover	Rig-days (workover barges)	Total costs
Sidetracking and deepening:		
Miocene to Eocene	16	$62,500
Plug back to upper pay:		
Eocene	10	27,500
Redrills and repairs inside casing:		
Miocene and Eocene	13	30,500

Average drilling costs, Maracaibo area

Total depth, ft.	8,200
Total cost	$201,850
Days	27
Dollars per foot	$24.62
Dollars per day	$7,925
Number of bits	10
Average service-company charges	$31,000

Cost breakdown, Maracaibo area

Item of cost	Producer	Dry hole
Casing and tubing	$41,600	$9,300
Fittings	2,900	2,900
Subtotal	$44,500	$12,200
Daily labor	$11,740	$7,410
Monthly labor	3,452	3,149
Indirect labor	9,366	6,466
Materials-supplies	17,500	9,860
Fuel and lube	12,000	765
Equipment rental	20,790	15,900
District supervision	2,300	1,700
Miscellaneous	900	400
Launch expense	11,600	6,840
Transportation	14,350	29,000
Service company	27,020	19,200
Drilling mud	19,000	25,100
Subtotal	$150,018	$125,790
Total	$194,518	$137,990
Total depth, ft.	7,800	9,950

Greater Oficina

Development wells	
Total depth, ft.	7,650
Total cost	$124,200
Days	23
Dollars per foot	$16.24
Dollars per day	$5,400

necessarily be subjected to one or the other of the above dehydration processes.

No desalting plants as such are in operation in the country with exception of refineries. In a few cases, however, due to the high salt content of water produced with crude, a form of superdehydration is carried out, keeping shipping cuts low enough to meet refiners' or purchasers' specifications. Fortunately, the majority of waters produced with crude in Venezuela, especially in the western fields, are of very low salt content; consequently, attention is given to either dehydration for pipeline requirements or, in isolated cases, the above-mentioned superdehydration.

Field service . . . An international oil-treating firm with offices in Hotel Avila, Caracas, has an efficient field force of specially trained engineers, and offers services on chemical and electrical dehydration as well as chemical corrosion control. No charges are made for services of consultation on emulsion, corrosion, or desalting problems; and in the event of installation of an electrical plant, an engineer is on hand for installation and startup of all such equipment.

The equipment is usually installed on a rental basis with the company furnishing the pressure vessels, electrical equipment, etc., with customer furnishing the piping, labor of installation, pumps, and heaters. Charges are made on sliding scale per barrel of clean oil passed through equipment on a monthly basis. Chemical dehydrating agents are sold outright either by direct order from the United States or from stock from the local supply-company warehouses located in Anaco in eastern Venezuela, and Maracaibo and Las Morochas in western Venezuela.

The service engineers are available at all times to carry out tests on emulsions, to recommend proper compounds, temperatures to be employed, and to discuss type of plant. A pilot plant is also available for tests with regard to treatability of emulsions electrically, throughputs of various size units, required temperatures, and for obtaining other pertinent data on treating problems.

Electric vs. chemical . . . While no set rules can be made regarding dehydration, it is a general rule that the heavier, more viscous crudes can be more economically dehydrated electrically while the higher-gravity, less-viscous types can be dehydrated more efficiently and economically thermochemically. There are many exceptions to this general rule in Venezuelan producing areas for considerable crude up to 30°-gravity API is being treated electrically through electrical equipment, and crudes of as low as 12° API are being treated successfully thermochemically. Much information as to proper type of plant and system to be installed can be obtained by working with service-company experts in carrying out treatability tests in field and laboratory with various chemical compounds by utilizing the pilot plant.

Another problem which will confront the producer when emulsion problem shows up is whether to segregate wet oil or treat the entire stream as soon as water contamination occurs. Most operators have manifold hookups whereby wet wells can be switched

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through a wet-oil separator and segregated from the clean-oil producers. There are some cases, however, such as the water operations in Lake Maracaibo, where it has been found to be more economical to treat the entire stream rather than to expend the large amounts necessary for additional flow lines for segregation. At present no dehydration plants are in operation or contemplated in the lake offshore; all crude is pumped or flowed onshore to central plants.

Central or localized treaters? . . . Considerable study must be given to either installing large-volume central treating plants, either electrical or thermochemical, or installing flow treaters at flow stations throughout fields.

In western Venezuela where large volumes of crude are to be dehydrated in concentrated areas, the trend is toward central plants, while in eastern Venezuela the trend is toward flow treaters, most thermochemical.

It has been found that national operators with proper training make very good operators of treating plants of the types above discussed. Due to the isolation of some of the flow-treating equipment, it is best to have everything equipped with automatic controls so that little supervision is necessary. Big operators treating large volumes have a treating engineer in charge who devotes all his time to design of plants, study of problems, and supervision.

Disposition of Produced Gas

The gas-oil ratios of wells producing in Venezuela, generally speaking, are extremely low. It is estimated that the average gas-oil ratio of all wells producing in Venezuela would aproximate 800 cu. ft. per barrel. The gas-oil-ratio average of Lake Maracaibo producing wells would be on the order of 400 cu. ft. per barrel.

Until the last few years most of the gas has been vented to the atmosphere both on the land and on the water. Considerable attention is being given to this subject by the government, and much stricter rules are being applied towards the utilization of gas.

Repressuring . . . Many projects are being worked on throughout Venezuela, and a new producer can well expect a sizable expenditure for some form of gas-utilization project when obtaining production in Venezuela. Actual gas consumption in Venezuela in the past has amounted to only a small percentage of the total gas produced. The rapid growth of the country, however, requires the use of more gas for domestic consumption. Several projects, especially in eastern Venezuela, are under way at present to gather gas and transport it to points of consumption. The rapid industrial growth of the nation also promises to utilize a much higher percentage of the gas produced in the next few years.

Repressuring projects for Lake Maracaibo operations will generally have to be constructed over the water, and since foundations and construction costs are extremely high in Venezuela and especially on the water, sizable expenditures must be projected in connection with repressuring projects as production is found in this area.

Types of Crude

The gravities of Venezuelan crude oil usually fall in the medium to low-gravity range. Thus the crude is utilized more in the producing of fuel oils than in gasoline. Gravities of production along the western shores of Lake Maracaibo may fall as low as 9° and have a viscosity below 26,000 seconds.

Miocene crudes both in the lake and on the eastern shore of the lake vary from 11° to 25°. Eocene crudes in these areas usually average above 25° but are still considered as medium-gravity oil and with a few exceptions do not command premium prices. There are a few lake fields which produce light oil ranging above 35°.

East of Maracaibo in the State of Falcon, production averages much higher in gravity than that in the State of Zulia. Wells found in Cumarebo, in the north-central portion of this state, produce oil of high gravity which commands premium prices.

Barinas area oil is of medium gravity and up to the present, little use of this crude has been made since outlets were not available.

Maturin area oils vary from medium to extremely low grade, being higher in the northern section and grading downward as the Delta Amacuro area is approached. The entire area, generally speaking, can be classified as a low-gravity area and with few exceptions all crude is presently being utilized for fuel-oil production.

Barcelona area oils average from medium to high grade, and there are several fields in this area which produce distillate and high-paraffin-base oils. A high percentage of this area's oil is exported and refined for gasoline and lubricating-oil manufacture.

Throughout Venezuela considerable effort is devoted solving the lifting and transportation problems connected with producing low-gravity oil.

Producing Costs in Venezuela

Producing costs are defined as all expenses incurred in finding and producing oil into flow stations (Lake Maracaibo) or gathering stations (land). These costs are divided generally into five features, namely:

1. **Direct costs,** which cover all direct expenses incurred in producing crude, such as labor, transportation, supplies, repairs to wells, artificial lift, treating, pressure maintenance, and stabilizing.
2. **Indirect costs,** which cover the expenses incurred by district supervision, departmental supervision, employes' welfare, and social security.
3. **Depletion** of acreage investment and **depreciation** of lease and well investment.
4. **Administration and others,** which covers the expenses of administration, inventory, adjustments, profit and loss from retirements or sales, and other miscellaneous items.
5. **Finding,** which covers expenses of rentals and taxes in nonproducing concessions, dry holes, test-well contributions, and exploration expense.

Producing costs in Venezuela have varied considerably since the end of World War II. Since this time (1945) production in Venezuela has increased from slightly over 323 million barrels annually to a 1957 first-half average of over 1 billion barrels per year, or an increase of 237 per cent. During this same period producing costs rose to a high of around 80 cents per barrel in 1949 and are now running at approximately 44 cents per barrel on a nation-wide average. The respective percentages over 1945 figures amount to: 200 per cent in 1949; 100 per cent average at present.

Present producing costs, based on 1945 costs, are considerably higher: Direct expenses have increased around 231 per cent, indirect expenses have increased will over 400 per cent, depletion and depreciation expenses have increased some 200 per cent, administration and other expenses are up over 250 per cent, and finding expenses are 165 per cent higher. These increases in expenses are indicative that costs have been increasing steadily, and a new operator entering Venezuelan operations must be aware of these facts and be ever on the alert to keep himself competitive.

Factors which have contributed to the large increase in present indirect costs over those in 1945 are:

District supervision up 1,900 per cent due to getting staffs up to required limits and the establishment of many isolated districts.

Departmental supervision up 85 per cent.

Employes' welfare up over 4,100 per cent (here better living conditions, increased medical benefits, more take-home pay, hold-the-line efforts on cost of living for employes, and expanded training programs have contributed materially to costs).

The net situation is this:

Indirect costs average 175 per cent of direct costs.

Finding costs, through fluctuating due to budgeted exploration programs, average over 100 per cent of direct costs.

Depletion and depreciation averages over 100 per cent of direct costs.

Administrative costs average 50 per cent of direct costs.

It may be realized that efficiencies practiced in operating districts, the extent of artificial lift in any particular field, the amount and extent of exploration as compared to producing wells or production, the amount of workovers in a proven field, all play an important part in distorting costs upward or downward.

Venezuelan district supervision expense is a sizable portion of producing costs. This expense is controllable generally by the district and is made up through costs incurred in maintaining their staffs. The report discusses in detail the general magnitude of each staff group with respect to the total cost of the district and illustrates the so-called "staff" group expense as compared with the actual operating group expense.

Departmental Setups

The producing department of any company, to a large degree, is self-sufficient in its operations. Not only are employes engaged in producing oil but they create and maintain their own communities, and furnish their utilities, sanitation, medical, food, schooling, housing, communications, safety force, equipment repairs, maintenance shops, transportation both for materials and personnel, aviation fleets in some cases, and in many instances their own Venezuelan flag tanker fleet.

Outside contracting . . . Contractors are becoming more important in Venezuela, and at present on a nation-wide basis, are estimated to be meeting 15-20 per cent at all producing departmental requirements. In view of the fact that many of the functions carried out by the major companies producing in Venezuela are extremely costly and that contractors are available in most areas for operating many of the services necessary to producing in Venezuela, it would behoove a new operator to give serious consideration to contracting as many of the services as possible, holding for himself only the producing and drilling and oil-handling duties. As has been pointed out previously, more than 50 per cent of the people employed in a normal producing district are required for functions which back up the producing and drilling people. The contractor can perform these duties at a much more reasonable cost because of his lower overhead

Steel bearings run at 1,000° F. . . . without oil

A RESEARCH GROUP working under a U. S. Air Force contract has developed a way to overcome a major obstacle in the development of ultrasonic aircraft and guided missiles.

Dr. Alfred G. Cattaneo, of Shell Development Co., a member of the group, said the research team had found a means of operating metal bearings at temperatures approaching 1,000° F. without the aid of conventional lubrication. Oils and greases now in use limit operating temperatures of metal bearings to about 500° F.

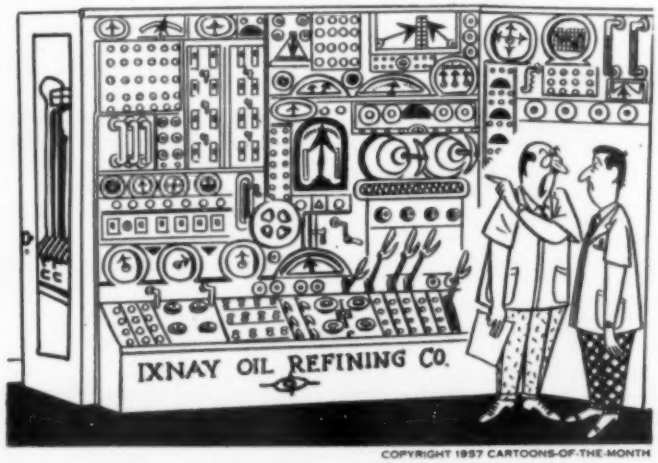
In the new technique, the high-temperature, high-speed bearings are surrounded with certain hydrocarbon vapors and other additives in vapor form. This "protective atmosphere" prevents the formation of iron oxide which forms when such bearings are operated under ordinary conditions. The iron oxide is an abrasive which was found responsible for breakdown of bearings run without oil or grease.

The scientists reported they had successfully used the "protective atmosphere" method to operate bearings for 100 hours in temperatures approaching 1,000° F. Even under these conditions, the bearings showed no evidence of pending failure.

Dr. Cattaneo pointed out that lubrication has become increasingly difficult as aircraft have reached and exceeded the speed of sound. At such speeds the air passing over the aircraft reaches such high temperatures that it can no longer be used to cool the lubricating system. The new method promises successful operation of aircraft and missiles through temperature ranges which until now have made lubrication either extremely difficult or impossible.

The investigation followed up a discovery made in the course of Shell's program of basic research. When the results hinted at practical usefulness to the country's missile program, Shell informed the Air Force which then sponsored an additional program to explore application of the discovery.

Further research on "protective atmosphere" lubrication is now being conducted at the Emeryville research laboratories of Shell Development Co. The current investigations are aimed at defining optimum combinations of materials and mechanical configurations for use with the new method.



"I said we did NOT need the 'tilt' indicator . . ."

REFINING

Low-cost alky-system depropanizer

efficiently removes propane from Humble's system at Baytown. Its special features are designed to depropanize condensed vent gas from the refrigeration compressor condensate accumulators. Chief advantage: higher propane concentration, thus low-cost design and operation.

BY W. O. WEBBER
Humble Oil & Refining Co.

THE UNIT consists principally of:

1. A feed condenser utilizing 78° F. well-water makeup to the reservoir as a coolant;
2. A 60-ft.-high by 30-in. diameter fractionating tower utilizing Spraypak cartridge packing for liquid and vapor contacting;
3. Internal reboiler and reflux condenser;
4. An external - product condenser doubling as a product accumulator, a bottoms-to-feed exchanger, and one product pump.

Removable cartridges provide flexibility if it becomes necessary to change the material of the packing or to obtain a lower height-equivalent-to-a-theoretical-plate (HETP) to get more plates in the same tower shell. The advantage for the internal heat exchangers, low-fin U-tube bundles, lies in the investment savings in shells, floating heads, and separate foundations.

Load advantage . . . The load advantage accrues to the depropanization of vent rather than alkylation-plant reactor product or deisobutanizer overhead because of its high-propane concentration, about 25 per cent. These streams are shown in Fig. 1, which is a simplified flow diagram of the alkylation system. The three streams deserving consideration for propane removal are marked with an asterisk: No. 5, vent; No. 6, reactor product; No. 7, deisobutanizer overhead.

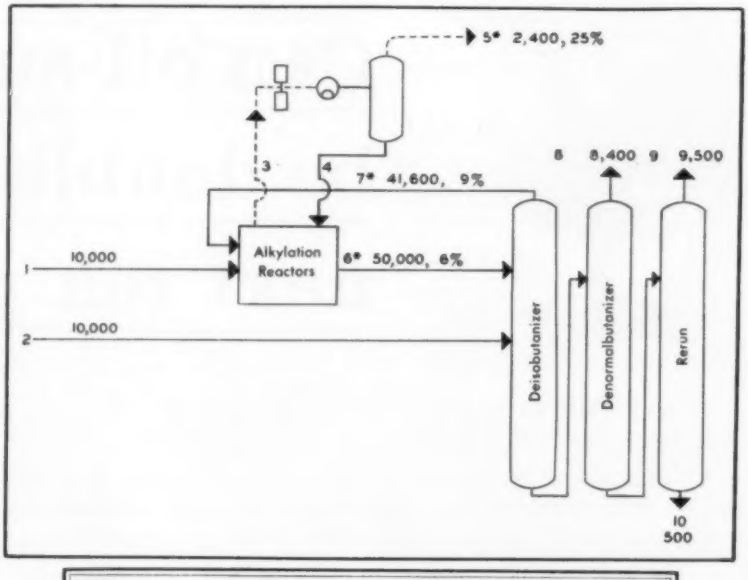
The propane concentration in the reactor product is about 6 per cent and in the deisobutanizer overhead 10 per cent. To remove the total volume of propane entering the reactor system, it is necessary to depropanize a proportionally smaller stream by choosing the compressor condensate vent for fractionation.

Since the volume of propane entering the system is about 600 bbl. per calendar day and the alkylation-plant system is operated so that the vent gas contains 25 per cent propane, then 2,400 bbl. per day of vent must be handled through the depropanizer.

The advantage to this design in terms of first cost is achieved principally by locating the reboiler and the overhead condenser inside the tower. This was achieved by the use of finned tubes to obtain a high heat input per cubic foot of tower volume. It is estimated that the savings in terms of externally located heat-exchanger shells and foundations are about $10,000. This saving is about 25 per cent of the cost of the tower itself, and 6 per cent of the total cost of the project.

Flow pattern . . . As shown in the flow diagram, Fig. 2, the vapors from the refrigeration-compressor condensate accumulators (at 105° F. and 80 psig.) are condensed in a feed condenser and accumulated in a feed surge drum, equipped with internals for settling water.

The vapors must be condensed so



NOTE:
Numbers refer to stream identification total concentration.

INPUTS:
1 Butylene containing stream
2 Isobutane containing stream

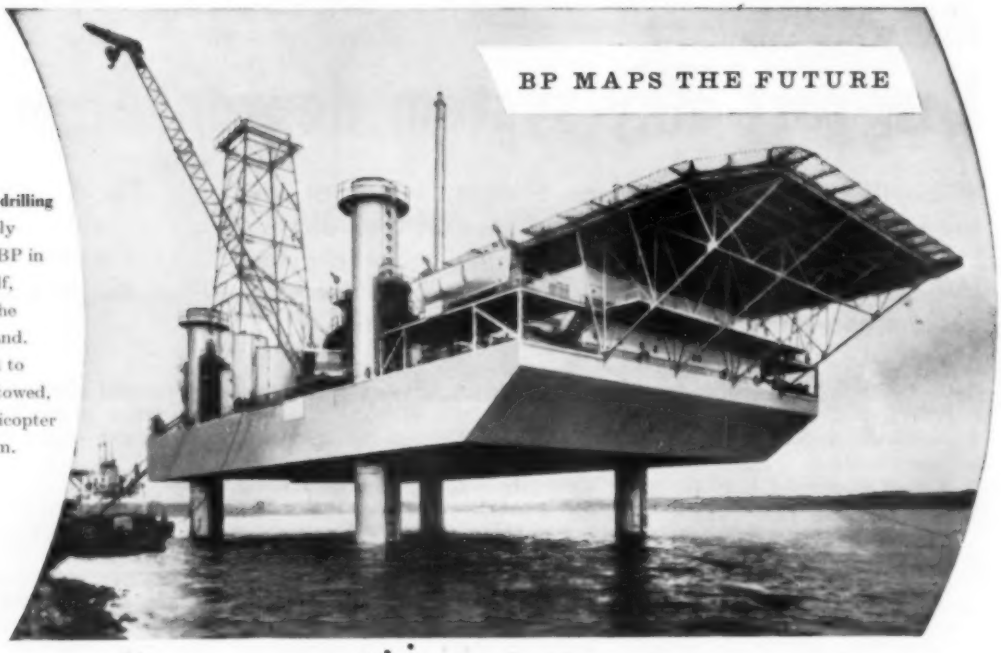
INTERMEDIATE:
3 Refrigerant vapors
4 Condensate return
6 Reactor product
7 Isobutane recycled to process

* Streams deserving consideration for depropanization

OUTPUTS:
8 Normal Butane to Motor Gasoline
9 Rerun Alkylate to Aviation Gasoline
10 Heavy Alkylate to rerun for Motor Gasoline
5 Vent Butane-Propane stream; stream; Subsequent processing removes propane and returns Butanes to system.

SCHEMATIC DIAGRAM of sulfuric acid alkylation system with butylenes-isobutane reactants. Fig. 1.

BP MAPS THE FUTURE



This underwater drilling barge will shortly be at work for BP in the Persian Gulf, 80 miles from the Arabian mainland. The legs retract to enable it to be towed, and it has a helicopter landing platform.

Can oil supplies be doubled in the next ten years?

TODAY THE WORLD is using twice as much oil as in 1946. So far, production has kept pace with demand. At its expected rate of increase, by 1966 demand may well have doubled again. What is being done to meet this situation?

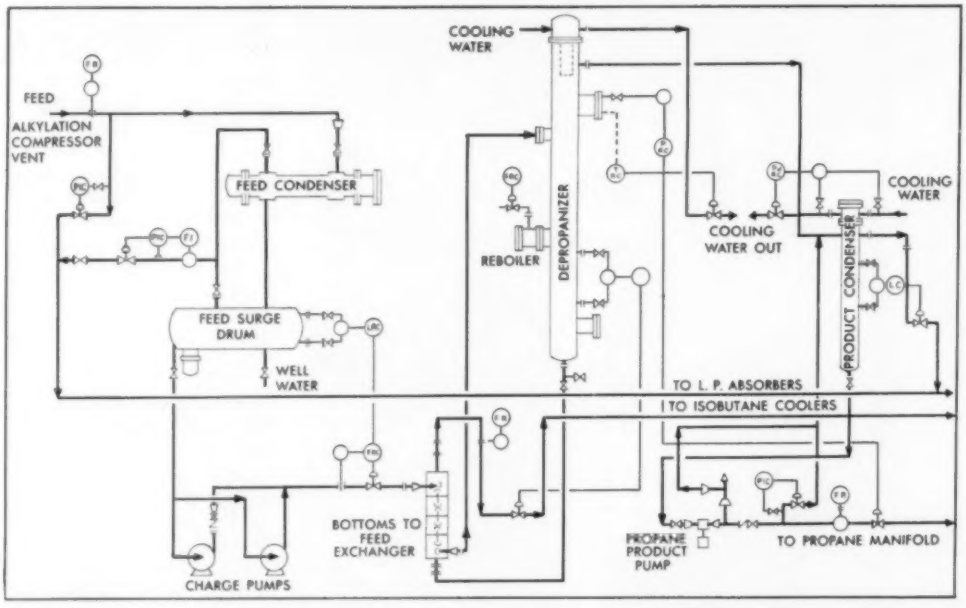
The answer is that exploration in known and suspected oil-bearing areas is proceeding on a colossal scale. In this world-wide operation the BP Group of Companies and its Associates are engaged, in some twenty countries, at an investment cost running into millions of dollars.

BP is also increasing the capacity of its fourteen refineries; adding new vessels to its 2,000,000-ton tanker fleet; expanding its marketing system, which already covers a great sweep of the globe, from Canada through Europe to Asia, to New Zealand. In 1946 the world used a hundred and fifty million barrels of BP products; in 1956 four hundred million.

The ever-increasing demand for oil must be met: no organisation in the world is working harder to meet it than The British Petroleum Company.

THE ***British Petroleum*** *COMPANY LIMITED*

BP



THE DEPROPANIZER will operate on liquid feed about 20° F. below its bubble point. Depropanized isobutane is returned to the alkylation reactors. Fig. 2.

that they can be pumped into the depropanizer which will operate at about 230 psig. These vapors will be condensed by means of 78° F. well water which is now used for reservoir makeup. The feed will be pumped through a double-pipe bottoms-to-feed exchanger and enter the tower about 20° F. below its bubble temperature.

The overhead propane can be vented to low-pressure absorbers, or it can be condensed and sent to a propane manifold. The bottoms isobutane will flow through the bottoms-to-feed exchanger to alkylation-plant isobutane coolers, and then to the alkylation-plant reactors, mixed with the isobutane from the deisobutanizers.

Exhaust steam will be used as a heating medium for the finned-tube internal reboiler. The reboiler has been sized to load the fractionating column with exhaust steam as a heat source, but the channel head and the tube sheet are designed to utilize live steam so that the function of the column can be changed.

Controls . . . The control system on the feed to the unit utilizes a rate-of-flow control, reset by liquid level in the feed surge drum. The basic controls of capacity utilization and cut point (percentage overhead) are achieved as follows: Capacity is controlled by heat input, with the steam to the reboiler set at about 2,300 lb. per hour.

Cut point, or equivalently overhead composition, is controlled by temperature and pressure above the feed. A nozzle is provided for the temperature and pressure measurements. For start-up, a temperature of 150° F. and a pressure of 230 psig. are used. The temperature is adjusted to obtain 2 to 4 per cent isobutane in the overhead.

Other control settings are shown in Table 1.

The intermediate tower temperature is controlled by the water rate through the reflux condenser by means of a regulator in the outlet water line. Pressure is controlled by the quantity of overhead product. When the overhead propane is produced as a liquid product for LPG or refrigerant, it is pumped through a regulator controlled from the tower internal-pressure measurement above the feed. When the pressure is too high, this valve opens to reduce the level of liquid propane in the vertical product condenser.

This exposes more condensing surface and reduces the vapor pressure of the contents of the condenser and, thus, the pressure in the column. At the same time, the removal of the additional quantities of overhead tends to pull more butane overhead which further reduces the vapor pressure of the overhead product. These two factors work together to produce rapid control of the pressure. The control system is designed to utilize hand control when producing overhead product as a gas.

Tower packings . . . Special design considerations may be organized around the comparisons of (1) packed versus plate towers, (2) cartridge versus loose packings, and (3) the properties of Spraypak which were used in this design.

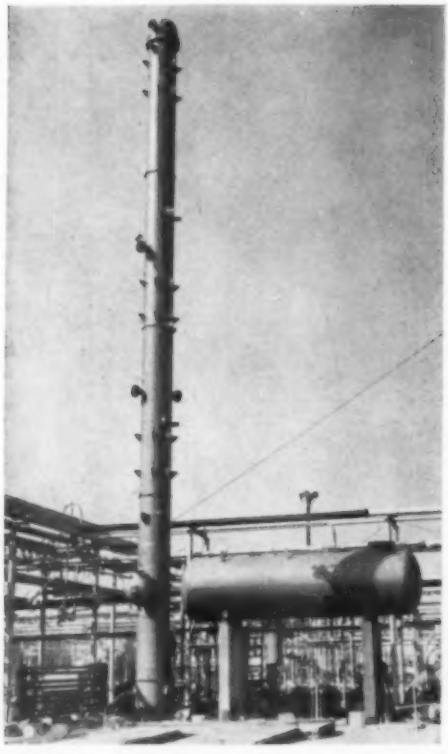
TABLE 1

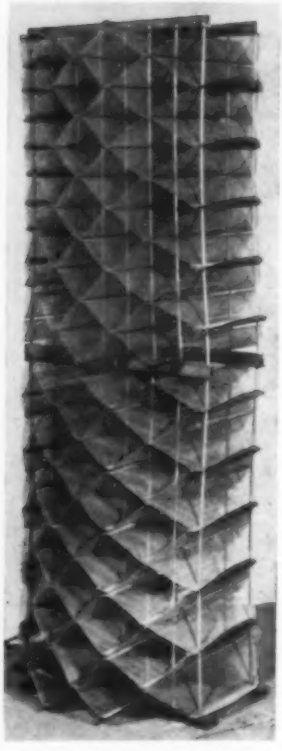
	Controlled by	Nominal rate (B/D)
Vent gas, feed	BPC	2,400
Feed to tower	LL	2,400
Bottoms	LL	1,800
Overhead if liquid ...	Tr. pres., intermd.	600
Overhead if vapor ...	Hand	600
Steam	RFC	*2,300
Water to reflux cond.	TRC	†500
Water to product cond.	PDRC	200

*Pounds per hour. †gallons per minute.

Packing offers flexibility in terms of dynamics for control of unsteady-state conditions because of the smaller liquid holdup for packed towers. For large towers, packing offers no opportunity for crossflow efficiency advantages as indicated for bubble-cap or sieve plates.[1,2]

Cartridges offer potential mechanical advantages over loose packings as regards ease of removal and ease of cleaning. Cartridges may be thought of as a form of stacked packing and, therefore, expected to allow less channeling. Consideration was given to wrapping these cartridges in sheet-metal sleeves but this was abandoned because the packing is of a low-pressure-drop variety. It is felt that any vapors flowing up the tower between the packing and tower shell can easily wander back or flow back into the packing and not make a complete trip from the bottom of the





TOWER, internal reboiler, internal reflux condenser, and separate feed surge drum are shown here. The double pipe at left of tower base is the bottoms feed exchanger. The depropanizer packing, shown at right, is a honeycomb, made of single layers of expanded metal elements. Fig. 3.

tower to the top, or even the length of the one cartridge, which is about 4 ft. Such sheathing has been tried, with poor results.

One problem which came up fairly late in the engineering phase of the design was the clearance problem. The diameter of the tower was specified at 30 in. ± 0.3 in., and the diameter of the packing cartridges was specified at 29.7 ± 0.3 in. Thus, it is apparent that clearances as high as three times the tolerance, or 0.9 in., could exist. For this to occur, however, every possible thing that could go wrong would have to occur, and at the same point in the tower.

Statistically, this should not happen, and the most likely clearance can be calculated by a root-means square as 0.212 in. = rms clearance (over-all)

$$= (S.D._{pk}^2 + S.D._{tr}^2)^{1/2}$$

Where:

$S.D._{pk}$ = standard deviation of packing diameter = 0.15, assumed to be one-half of tolerance.

$S.D._{tr}$ = standard deviation of tower diameter = 0.15, assumed to be one-half of tolerance.

With this as a basis, the probability of clearance ≤ 0 (packing too large) = 8 per cent or 1 cartridge out of 12. The probability of a clearance of 0.6 in. or more is also 8 per cent. And the probability that adjacent cartridges have large clearances and that these clearance passages line up to permit a long passage for channeling is even smaller. In operation, a clearance of 0.212 in. calculated above should not reduce HEPT appreciably since a wetter-wall column with 0.212 in. should have about 2 ft. HEPT, essentially the same as this packing.

The packing . . . The packing is similar to Panapak[3] in that it is a honeycomb as shown in Fig. 3. It differs, however, in that it is made of single layers of expanded metal elements, whereas Panapak is made up of multilayers of open metal lath.

One difficulty in the use of loose packings has already been distribution, making it necessary to install redistribution every 2 to 5 ft. for small towers to prevent channeling of the liquid down one side of the packing and the vapor up the other side. A movie of the operation of this packing indicates good self-distribution.

The capacity of the packing is about the same as a bubble plate with a 2-foot plate spacing.

It is claimed to have a HEPT near flooding of 18 in. It is less efficient at low rather than at high loads; that is, the HEPT is greater below flooding. This is one of its important operating factors, as capacity operation yields a double advantage in terms of both reflux ratio and stages. It is also a reason for avoiding overdesign.

This packing was developed by the English Atomic Energy Research Establishment for use in the separation of heavy water, HDO, from ordinary water, HHO.[4]

HEPT-capacity exchange . . . One of the advantages for this design is the ease of removing the packing cartridges. One feature which is desirable in a fractionating tower designed to do many different fractionating functions is some means by which the number of plates in the tower can be varied without limit, assuming that exchange with capacity is admissible. This was a secondary objective in this design.

For extreme flexibility, it is necessary that (1) the internals may be easily interchanged, and (2) that a type of internals is available which has the property of exchanging plates for capacity. An attempt was made to prepare this design to meet the first goal.

The need still exists for the second development in a cartridge packing. To a certain extent, this second goal has been achieved by virtue of the different types and sizes available. The range of HEPT which is covered, however, is rather small, varying from 14 to 26 in., accompanied by a capacity gain of only about 10 per cent.

Acknowledgments

The writer is grateful to all who have aided in this project. R. E. Kappler, of Humble Oil & Refining Co., engineering division, prepared the mechanical design which embodied some unusual problems. N. W. Locker and I. Boyce prepared the drawings. C. H. Marshall encouraged the work and J. C. Dickson made the statistical analysis.

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Operating angle compressors

for combustion and exhaust purposes

IN THE OIL INDUSTRY, angle compressor is the description given to the engine-compressor units in which the power cylinders are at an angle to the compressor cylinders. There are several types, according to power cylinder arrangements. One type is illustrated in Fig. 1.

Small compressors are built on the angle principle. They are crank driven, and the cylinders are all compressors. The larger gas compressor units are manufactured with from one to eight power cylinders, 50 to 1,000 hp., and compressor cylinders to handle pressures from a vacuum to 5,000 lb.

There are a number of other arrangements used, but those mentioned are the common ones in the industry. In the horizontal group there are tandem units. Both pistons are on one rod. This type of compressor is necessarily single acting. No packing is required between the pistons, that space being piped into the low-stage intake to take care of any leakage past the piston rings.

The operating principle of the two-cycle engine is shown in Figs. 2 and 3.

In Fig. 2, the power piston has started upward, closing off first the intake ports and next the exhaust ports. The fuel gas is injected to the cylinder and mixed with the supply of air that has just been admitted. As the piston moves upward the compression of the fuel gas and air mixture continues until ignition.

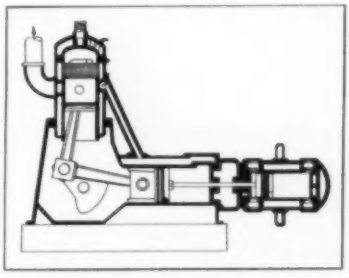
In Fig. 3, the charge has been ignited and expanded and the power piston approaches the end of its stroke. As the piston approaches bottom center, it uncovers a series of exhaust ports allowing the hot, spent gases to escape, dropping the pressure within the cylinder to approximately atmospheric.

Shortly after the exhaust ports are open, the inlet ports open, admitting a charge of fresh air. The air is directed upward to the cylinder head and then down to the exhaust ports sweeping all spent gases out of the cylinder which results in thorough scavenging of the cylinder. Air continues into the cylinder until the ports are covered by the upward stroke of the piston.

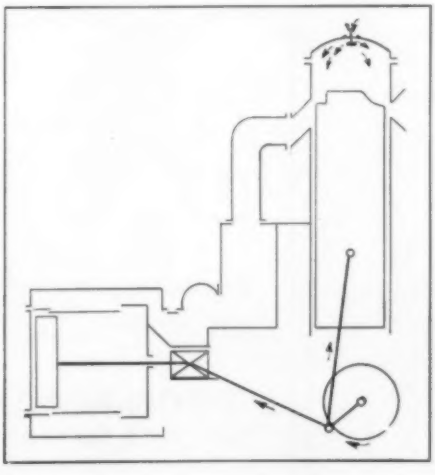
The scavenging cylinders which supply the air to the power cylinder are double-acting. They pump air into a manifold holding a large supply of air at a constant pressure of approximately 3 to 3½ psi.

After studying Figs. 2 and 3, it will be seen that the two-cycle engine depends upon a scavenging action for removal of exhaust gases and for air admittance to obtain proper fuel-air mixtures in the power cylinder. Do not confuse the scavenger piston and cylinder shown, with the process-gas compressor end of the machine. The scavenger supplies air for combustion and exhaust purposes and does not pump process gas.

This material taken from process-training-program manual, Baton Rouge, La., refinery of Esso-Standard Oil Co.

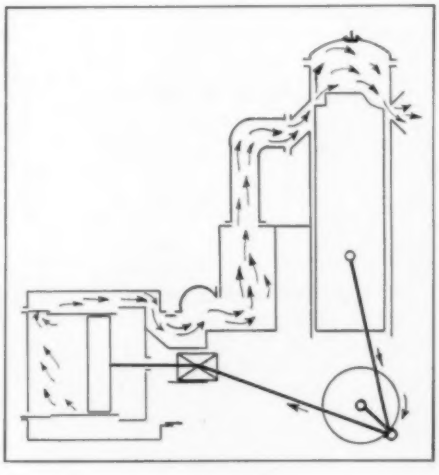


ANGLE COMPRESSORS have power cylinders at an angle to compressor cylinders. Action of this compressor is shown below. Fig. 1.



POWER PISTON moves upward as fuel gas and air is compressed. Fig. 2.

AFTER IGNITION, exhaust ports allow spent gases to escape. Fig. 3.



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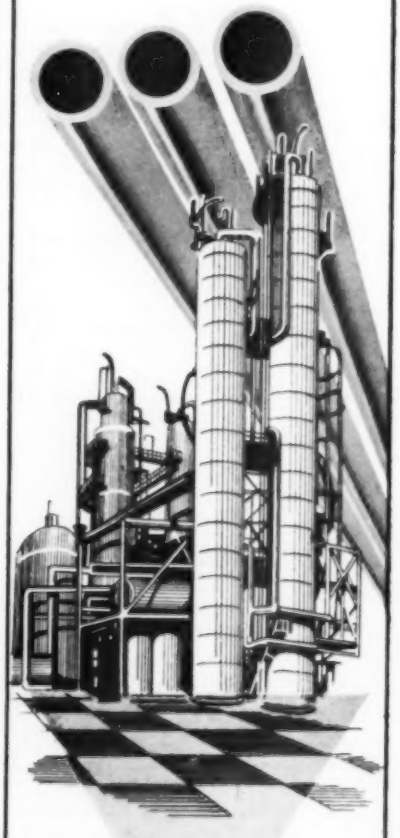

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Eight new plants

on West Coast are planned or under way

SHADED PORTION of map is area covered in this survey.

• **Alaska-Yukon Refiners & Distributors, Ltd.,** will complete a $6,000,000, 7,500-bbl. plant at Haines, Alaska, in 1958. It will include a 2,500-bbl. thermal cracker.

• **Bankline Oil Co.** will complete October 1958, at Bakersfield, Calif., a 4,000-bbl. Sinclair-Baker reformer and a 4,000-bbl. hydrodesulfurization unit.

• **British American Oil Co., Ltd.,** will complete late 1958, a 20,000 bbl. plant at Port Moody, B. C. It will include a 9,000-bbl. vacuum unit to charge topped crude, a 13,500-bbl. cat cracker (33 per cent recycle), a 4,000-bbl. Atlantic Catformer, a 7,200-bbl. sulfuric acid alkylation unit. **Canadian Kellogg Co., Ltd.,** has contract.

• **Cal-Mex Oil & Refining Co.** has let a $27,000,000 contract to **Ralph M. Parsons Co.** for a 20,000-bbl. plant near San Diego, Calif. Plant, to be completed early 1959, will include a cat cracker, cat desulfurizer, cat reformer, and a sulfur-recovery unit.

• **Douglas Oil Co. of California** will increase crude capacity to 12,000 bbl. at Paramount, Calif., in 1959.

• **Fletcher Oil Co.** will complete a 3,000-bbl. Platformer-Unifiner at Wilmington, Calif., April 1958.

• **Pacific Cooperatives** is considering building a 15,000-bbl. plant at Vancouver, Wash. Preliminary plans include a cat cracker, coker, alkylation unit, and possibly a cat cracker.

• **Pacific Petroleums, Ltd.,** and **Phillips Petroleum Co.** are building at Taylor, B. C., a $15,000,000 plant to include distillation, cat desulfurization and reforming, dehydrogenation, butane isomerization, and alkylation. Pacific will operate plant.

• **Richfield Oil Corp.** plans a $50,000,000 plant at Everett, Wash., with probable completion set for 1965.

• **Rothschild Oil Co.** is adding an 8,000-bbl. cat cracker at Santa Fe Springs, Calif., at a cost of $2,000,000. **C. F. Braun & Co.** is contractor.

• **Royalite Oil Co., Ltd.,** will complete a 1,000-bbl. Platformer at Kamloops, B. C., March 1958.

• **Shell Oil Co.** will complete June 1958, a multimillion dollar, 2,400-bbl. sulfuric acid alkylation unit at Anacortes, Wash. **Fluor Corp., Ltd.,** has contract.

At Wilmington, Calif., **Kaiser Engineers** will increase Platforming capacity 12,500 bbl. by April 1958.

• **Standard Oil Co. of California** will build a $75,000,000, 60,000-bbl. plant at Mukilteo, a suburb of Everett, Wash.

At Bakersfield, Calif., a 5,500-bbl. Platformer and 5,500-bbl. Unifiner will be completed June 1958 by **Bechtel Corp.**

At Richmond, Calif., a 22,000-bbl. Platformer and 22,000-bbl. Unifiner will be completed by **Bechtel Corp.** July 1958, to replace existing capacity.

• **The Texas Co.** will complete a 40,000-bbl. plant at Anacortes, Wash., by January 1, 1959. It will include a 25,000-bbl. fluid cat cracker, a 7,000-bbl. Platformer, catalytic polymerization, sulfuric acid alkylation, and Hydrotreating. General construction is by **Bechtel Corp.** Furnishing and erection of tankage is by **Chicago Bridge & Iron Co.**

• **Tidewater Oil Co.** will complete a 22,500-bbl. Houdriformer at Avon, Calif., March 1958. **Bechtel Corp.** has contract.

• **Wilshire Oil Co. of California** will complete in 1958, a 3,000-bbl. alkylation unit, and add 2,500-bbl butane isomerization at Norwalk, Calif.

• **X-L Refineries, Ltd.** (Pacific Petroleums, Ltd.), will complete a 1,375-bbl. vacuum unit to charge topped crude and add 335 bbl. of straightrun asphalt capacity at Dawson Creek, B. C., by May 1958.

Watch for the complete U. S. and Canada construction report, plus the Journal's survey of refinery operations, in your **Annual Refining Issue,** March 21.

WORLD'S MOST MODERN REFINERY — Tidewater Oil Company's new Delaware Refinery, 15 miles south of Wilmington, represents the most advanced thinking of refinery engineers and technologists.

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For Further Information — Write Process Section Warner Lewis Company, Division of Fram Corporation, Box 3096, Tulsa, Oklahoma, for Process Manual on water separators/filters. Warner Lewis representatives are located throughout the United States and Canada and they will be glad to contact plant processing and operating personnel.

Beginning a new series
By W. L. Nelson, Technical Editor

1. PROCESSING COSTimating

Basic refining operating costs

THE AVERAGE COST of refining in the United States can be computed with good accuracy from the following basic information:

(a) Fuel—the total used for all purposes.

(b) Labor—total employes of the refinery.

(c) Purchased power.

(d) Interest on capitalization including working capital.

(e) Supplies—the total of all consumable materials.

(f) Repair materials of all kinds.

(g) Insurance and property taxes.

(h) Miscellaneous.

(i) Obsolescence.

(j) Improvement in quality (i.e., competition).

Such an approach is employed first in this series of articles not alone because of its simplicity but because it can be used as a check of the accuracy of the many other more detailed cost approximations. Exact figures are available each year on the major items of the above list, namely, (a) fuel consumption, (b) number of employes, (c) purchased power, and (d) financial charges based on investment or capitalization.

Average Refinery Operating Cost (1957). It is impossible to explain now the full meaning and the sources of the average costs shown in Table 1, but as the Processing Costs series develops, each item will be discussed and explained in several issues. This manner of itemizing processing costs is not the best method for many purposes and accordingly as the series proceeds, it will be necessary to isolate the operating costs of many process units and departments as well as the effect of the characteristics or quality of the crude oil.

Note especially that all regions include the high-realization ones of the East Coast, California, and isolated inland points.

Fuel Consumption. The Gross heating value of all fuels burned in the refinery. Catalyst coke, refinery gas, and acid sludge are produced and must be burned at the refinery, but natural gas, coal, and residual fuel have a market value. This heat generation supplies sensible and latent heat, steam, power for internal combustion engines and the generation of some electrical power. (U. S. Bureau of Mines yearly statistics.)

Labor and Its Burdens. All employes including those for management, operating labor, maintenance labor, laboratory and technical help, and labor used in utility services, including all benefits for social security, benefit plans, sickness pay, vacations, etc. (U. S. Bureau of Labor Statistics, monthly.) All labor except that for emergencies, new construction, contracted shutdowns, etc.

Purchased Power. Total kilowatt power purchased (USBM).

Financial Charges. Interest or dividends on all indebtedness and working capital.

Supplies. Cost of chemicals (plant and laboratory), makeup waters, office supplies, laundry, catalysts, etc.

Repair Materials. Purchased for direct use or for fabrication in refinery shops, and applied to what is called permanent equipment. Replacement with superior materials or additions to equipment are not classified as maintenance but as investment.

Insurance and Taxes. Ad valorem taxes and all types of insurance.

Miscellaneous. Running or allocated paid-up royalties (or research excluding salaries), fees, duties, entertainment, donations, etc.

Obsolescence. Only the replacement of useful equipment. This is not to be confused with the capitalization costs of new product-improving equipment. Depreciation is not included because it is already included in proper maintenance, in interest on the full capitalization, and because inflation has recently increased values fast enough to repay original investments.

TABLE 1—AVERAGE COST OF REFINING THE AVERAGE 34.5° API, 0.87 PER CENT SULFUR CRUDE OIL HANDLED IN U. S. REFINERIES DURING 1957 (ALL REGIONS)

	Amount	Unit Cost	Cost, $/bbl.	
Total fuel*	740,000 B.t.u./bbl.*	32.2 ct./M.M. B.t.u.‡	$0.238†	(0.115)‖
Total labor	259 men/10,000 bbl.	$143.00/week-man¶	0.530§	(.22-.64)
Purchased power	2.61 kw.-hr./bbl.	8.4 mills/kw.-hr.	0.22	
TEL, chemicals and supplies	(supplies taken as 3%)		0.224	
Maintenance materials			0.081	
			$1.095	(0.984)‖
Insurance and property taxes	2.15%/yr. of replacement value¶¶	$1,180/daily bbl.	0.069	
Royalties or research (excluding wages)‡‡	(usually one or the other and they are about equal)		0.012‡‡	
Obsolescence	0.85%/yr. of replacement value††	$1,180/daily bbl.	0.027	
Interest or dividends on capitalization**	4%/yr. of replacement value	$1,180/daily bbl.	0.129**	(0.07)
Profit before federal taxes	11%/yr. of replacement value		0.356	
Delivered crude oil	(Gulf Coast and New York)	(varies widely)	3.200	(2.80-3.60)
Value of products and fuel produced in plant (varies widely)			$4.888	(4.50-5.60)

*Including the burning of fuels produced in the refinery including coke on catalyst.

†Almost half of the fuel and fuel cost appears as a credit (FOE) in the product realization.

‡Based on the average heating values of all of the fuels burned and their prices or values at the refinery.

¶Average for all employes and including all payroll burdens.

§Many smaller refiners use only half as many employes and a few older large plants have even larger labor costs.

‖As shown in many operating cost summaries.

**Based on 1957. Actually the investment has been made in the past with cheaper dollars.

††Investment for product improvement (but not displacing any equipment) has recently been a far greater cost.

‡‡Wages constitute about two-thirds of the total.

¶¶Only about 0.15 per cent is insurance.

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All steels used in the manufacture of H. C. Smith Bits are made to our own strict specifications. We test every lot to ensure that it meets our requirements. And our forging process is controlled to maintain maximum strength in all parts.

HEAT TREATMENT

Standard samples of every heat of steel are put through our regular heat-treating cycle before parts are made. Thus the reactions of every lot are predetermined — the hardness and carburization of every part of a Smith Bit is a known factor even before manufacture.

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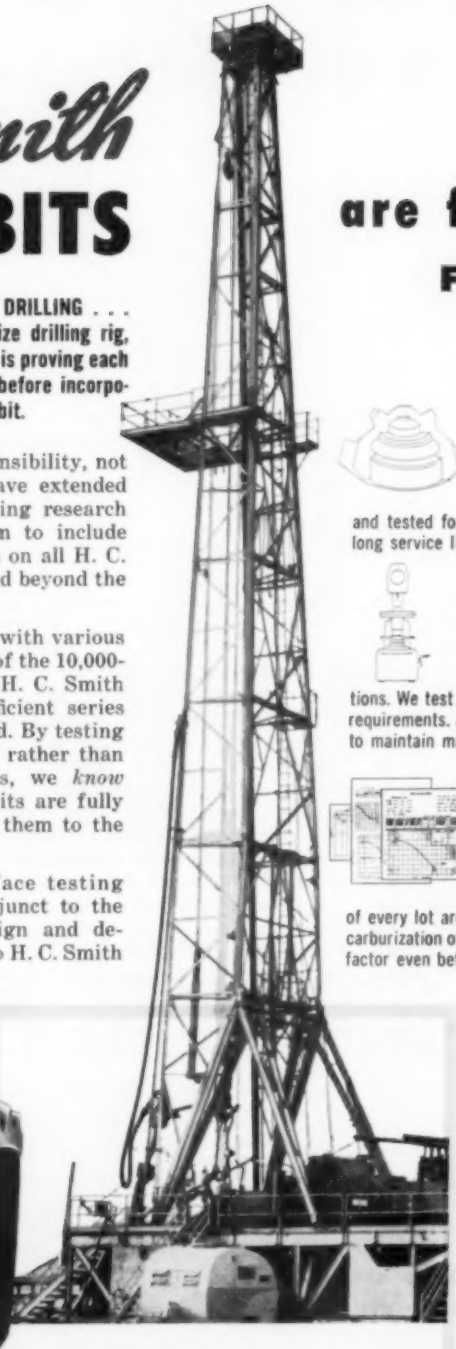

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Drilling Contractors

J & C Drilling Co., Refugio, Tex., is on a new contract job at Refugio, in Refugio County, lower Texas Gulf Coast. It is Refugio Enterprises' 4 Shelton. Plans call for drilling to 8,000 ft. Location is about a mile south of town.

Tine Gaiser Drilling Co., Bakersfield, Calif., is under contract to Western Gulf Oil Corp. for a 7,000-ft. exploratory test in the Lerdo area, 8 miles northwest of Bakersfield, in Kern County, California. The location, at 1 Lerdo-KCL, in 26-28-26, is about 1½ miles north of Rosedale Ranch field, productive from a shallow upper Miocene sand.

Crews Drilling Co. is on a new wildcat operation in Live Oak County, in the central coastal area of Texas. It is a 5,600-ft. contract job for Skinner Corp., of San Antonio, at 1 Hall, in the BS&F Survey 179, about 7 miles southwest of Dinero. This is in the southeast part of the county.

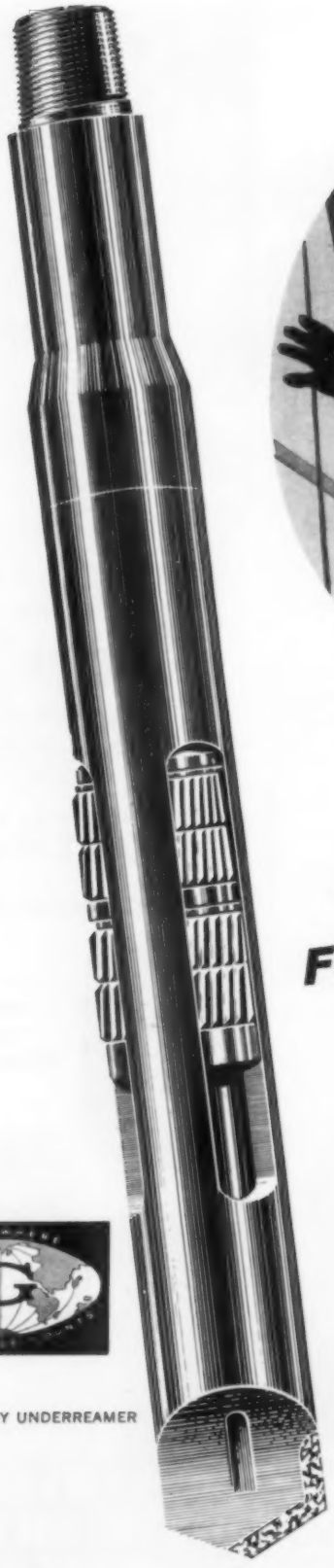
Commonwealth Drilling Co., Ltd., Calgary, Alta., is getting under way on another exploratory test it has contracted to drill for Northern Foothills Agreement Group in the Boundary Lake region of northeastern British Columbia. Location of this test, the group's 8 Texaco-N.F.A., is about 38 miles northeast of Fort St. John. It is about 4½ miles west of the group's No. 7, an indicated triple-zone gas discovery. The group is composed of Texaco Exploration Co., British American Oil Co., Ltd., Shell Oil Co. of Canada, Ltd., and Mobil Oil of Canada, Ltd. Proposed depth is 4,200 ft.

Texon Drilling Co., Corpus Christi, is on a new shallow wildcat job 6 miles southwest of Clarkwood, in Nueces County, Central Texas Gulf Coast. It is drilling for F. B. Cockran and Thomas Brothers at 1 Moore. Location is 1 mile south of Ramada field.

Dixie Drilling Co., Houston, has a new contract operation in northern Vermilion Parish, Coastal Louisiana. It is a Camerina test, calling for 11,000 to 12,000-ft. drilling, for Charles B. Wrightsman. Its location, at 1 Petry, in 6-11s-2e, is about 2 miles north of production in Leleux field. This is just south of the Acadia Parish line.

Yates Drilling Co. has contracted for a deep test to be drilled for a group composed of Midwest Oil Co., Petroleum, Inc., Gulf Oil Corp., and W. C. Feazel. Location is west of Branch field, 5 miles north of Rayne,

WELL TIME in the 2,500-ft. Prue-sand waterflood project Davon Drilling Co., of Oklahoma City, is drilling for The Texas Co. at Iron Post, 7 miles south of Bristow, in Creek County, Oklahoma, has been cut to 5 to 7 days, rig on and off. Davon's tool pusher on the job is Junior Brooks (second from right, in picture). With him are Voris Johnson (right end), Texaco foreman, and one of the rig's drilling crews. Crewmen, left to right, are: Mack Donaldson, Fred Smith, Babe Bailey, and C. H. Gertman (driller).



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in eastern Acadia Parish, South Louisiana. Spot is on the operator's Pettitjean Hebert lease, in 53-8s-2e. A 13,000-ft. test is planned.

Great Western Drilling Co., Midland, Tex., will drill another deep exploratory test for Shell Oil Co. in the Querecho Plains area, 10 miles south of Maljamar, in western Lea County, New Mexico. Hole will be carried to the Devonian about 13,700 ft. Location is about 1½ miles south of Pennsylvanian production at Querecho Plains. This is Shell's second deep test on the block. It is in 27-18s-32e.

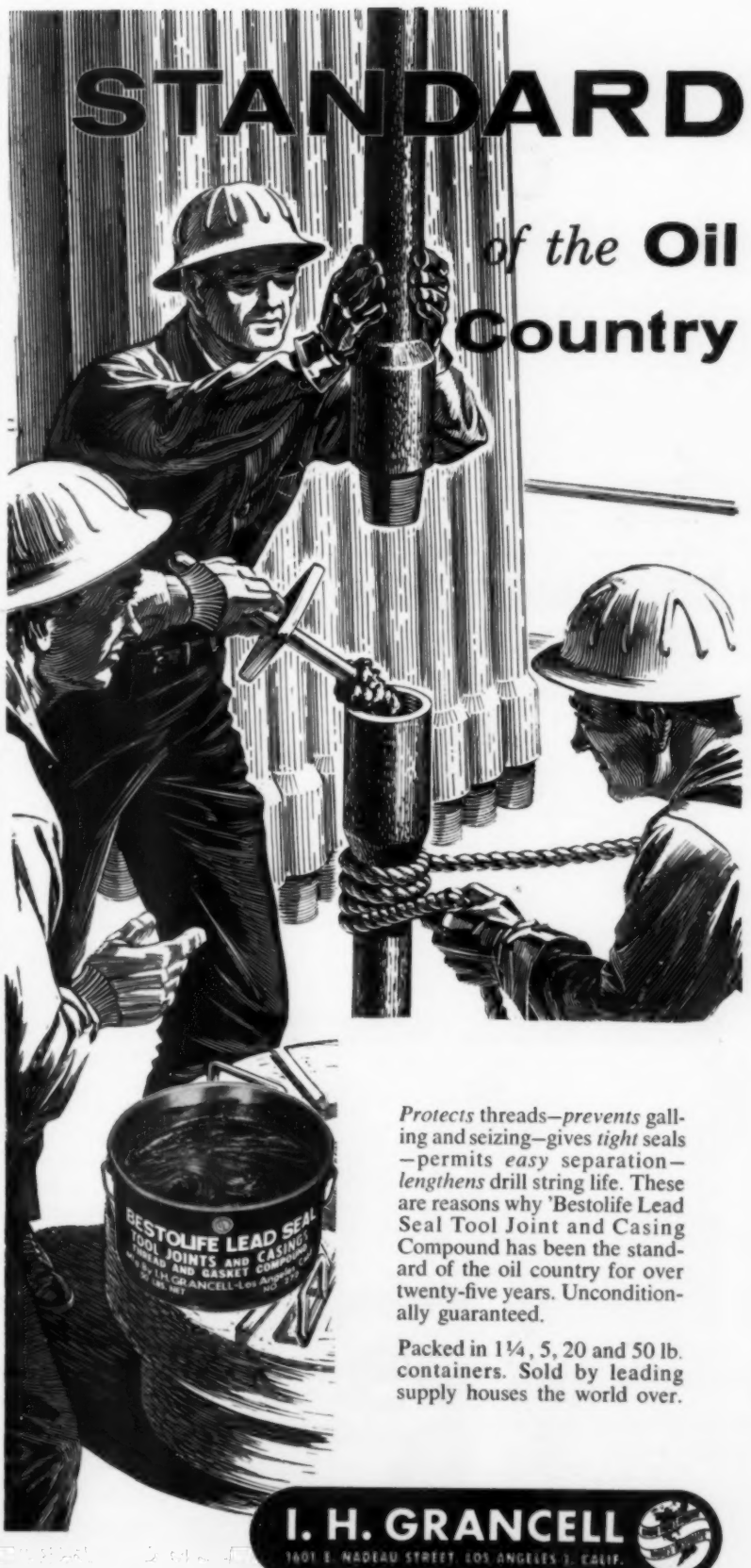
American Petrofina, Inc., has a rig under contract to Grelling Estate, of Tyler, Tex., for a 8,700-ft. Pettet test at a wildcat location 1½ miles west of Oman, in Smith County, East Texas. Location is given as 1 Bullock, in the William Miller Survey.

Jordan Drilling Co. is contractor on a 5,000-ft. test James K. Anderson, of San Angelo, Tex., is putting down 4 miles northeast of Bogata, in Red River County, northeastern Texas. Location is at 1 Stubblefield, in the John Nugent Survey.

Thirteen Drilling Co. has contracted for a deep wildcat test west of Bay Natchez field, in northwestern Assumption Parish, southeastern Louisiana. It will drill for American Natural Gas Co. and Zimm Petroleum Co. Operators have a permit for a 13,000-ft. test on their State Lease 3160. Location, near the Iberia Parish line, is about a mile west of production in Bay Natchez field. Production there is from sands below 13,500 ft.

Trant Drilling Co., Tyler, Tex., has taken a 9,800-ft. drilling job 4 miles southwest of Lindale, in Smith County, East Texas. It is a Travis Peak test for Neville G. Penrose, Inc., of Fort Worth, at 1 McFaddin, in the D. Barcroft Survey.

Regent Drilling Co., Edmonton, Alta., has contracted for another Shell Oil Co. exploratory test in the Utikuma Lake area of Northwest Alberta Province. Its new location, on LSD 10, 4-82-11w5, is about 45 miles southeast of Peace River. Nearest test, a dry hole, has been 8 miles distant. It is 35 miles south of Granite Wash oil production in the Red Earth Creek region. Rig for the test will come from another wildcat Regent is drilling for Shell about 50 miles north of the new location.



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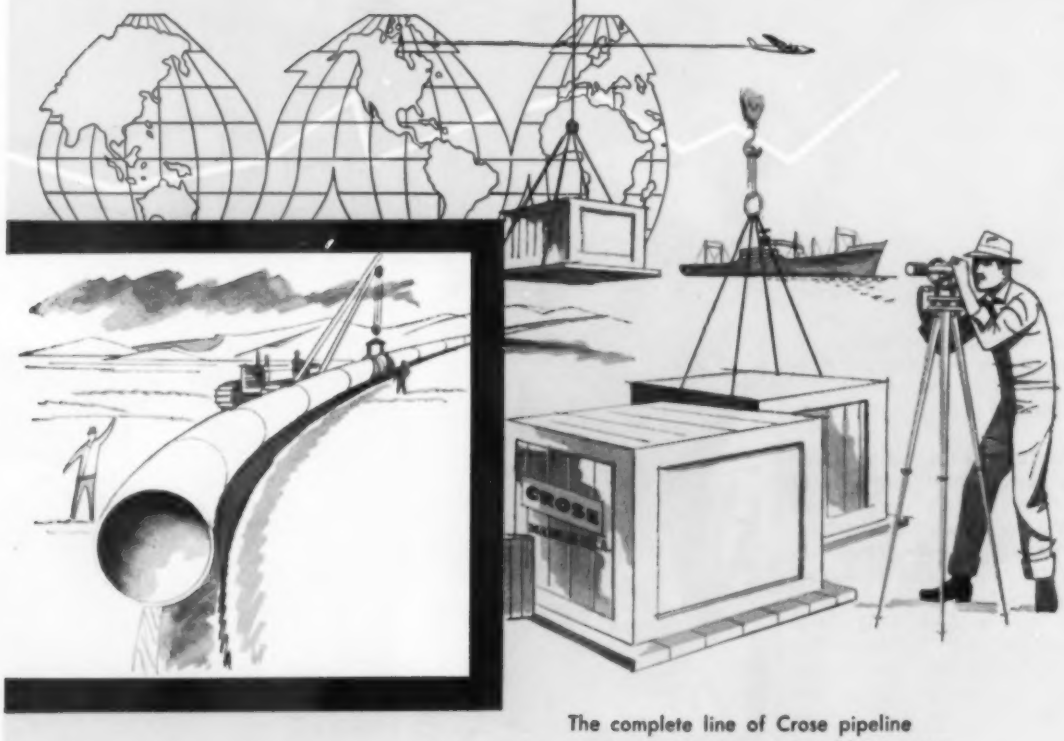

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Two meter-proving methods:

- Gravimetric
- Volumetric

BY M. L. BARRETT, JR.

OIL AND PETROCHEMICAL industries are today successfully metering millions of barrels of liquid hydrocarbons daily with positive-displacement meters, handling everything from asphalt to propane and at rates from 1/10 to 7,000 g.p.m. and greater. The varying physical properties of these liquids, the ever-increasing flow rates which must be metered, and our constant striving for greater accuracy of measurement have given rise to special problems of meter proving which have caused our industry to "dig" for some of the meter-proving answers in recent years.

Meter Proving

Before discussing meter-proving methods, it might be well to understand clearly the reason why meters must be calibrated or proved. Any positive-displacement meter performance (its factor or accuracy) may be affected by a combination of environmental conditions of operation which include:

1. Rate of flow through the meter.
2. Physical properties of the metered liquid, particularly viscosity.
3. Pressure at which the liquid is metered.
4. Condition of repair of the meter, hence the friction.
5. Extent of air, vapor or foreign-material entrainment.
6. Extent of control of evaporation of the test liquid during proving.
7. Temperature effects on the metered liquid and on the volume of the proving device.
8. Human errors of reading and calculation.

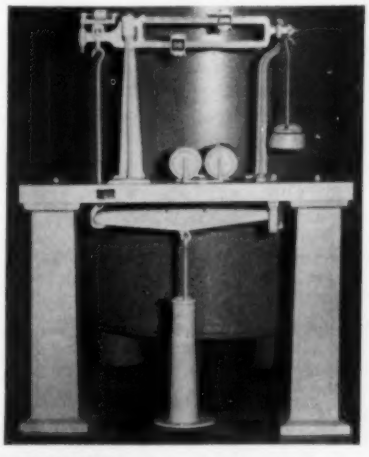
It follows, then, that a meter may have a meter factor anywhere within a relatively wide range depending on its environmental conditions. This dictates the most important criteria for accurate determination of the performance of any meter; i.e., the meter must be proved under conditions which are identical to those under which it is normally expected to measure.

If this basic principle of good meter proving is adhered to strictly and if enough check runs are made, the meter accuracy determined will truly encompass all of the variables of the particular installation involved.

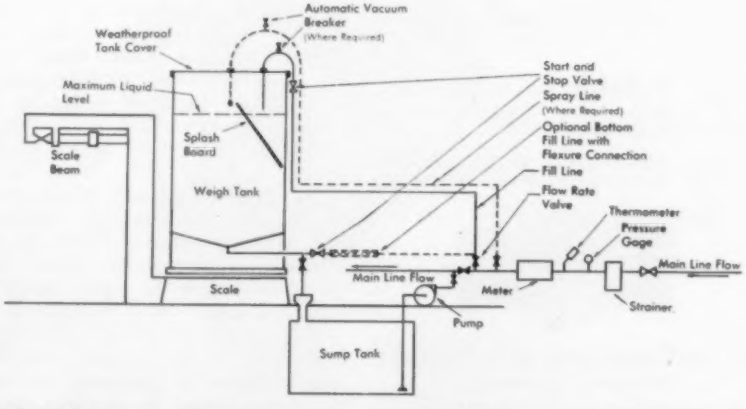
In reviewing the equipment and procedures currently considered useful and practical for proving meters, it is necessary to distinguish the two basic methods applicable: (1) There is the **gravimetric method** in which the quantity of liquid actually delivered by a meter is weighed and this weight compared with the corresponding meter registration after both have been converted to the same units of quantity, and (2) the **volumetric method,** in which the gaged volume units actually delivered by a meter are compared with the corresponding units indicated by the meter register.

There are two procedures for conducting a meter-proof run using either of these basic methods. In the first, called the "standing start and stop procedure," the meter is stopped, read and a delivery made to a prover after which the meter is again stopped, read and the quantity delivered to the prover weighed or gaged. The delivered and registered quantities are used to determine the meter accuracy.

In the second, called the "running



PERMANENT gravimetric prover has a 5,000-lb. capacity. Fig. 1.



SCHEMATIC operating diagram of an open gravimetric or weight-type prover. Fig. 2.

Author is with Shell Oil Co. Paper presented at ASME petroleum division annual conference, Tulsa.

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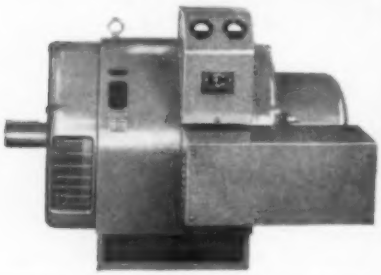

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FIVE-GALLON open-test measure is used to prove service station meters. Fig. 3.

FIFTY-GALLON open-type meter prover to check truck-delivery meters. Fig. 4.

start and stop procedure," the proof run is either quite long or the meter is equipped with a special supplementary register which can be started and stopped electromechanically or otherwise read on the fly while a predetermined quantity of liquid delivered by the meter is determined without starting or stopping the meter itself.

The standing start and stop procedure is primarily applicable to short, intermittent deliveries while the running start and stop is advocated for long or continuous deliveries.

Gravimetric Provers

Looking first at the gravimetric method, it is best applied to permanent installations. It is useful in the proving of meters of practically all capacities, but is primarily restricted in use to dark liquids such as viscous crude oils, which give gage and wall clingage troubles in a volumetric method, or to propane, butane or other high vapor-pressure liquids.

Fig. 1 is a relatively simple open-type 350-gal. weigh tank on a 5,000-lb. scale used to prove a group of 4-in. loading rack meters measuring No. 5 industrial fuel oil. This liquid is black and thick and would be a nuisance to clean out of a volumetric prover used for lighter products.

Fig. 2 is a schematic of installation of Fig. 1 showing the essential elements of a weigh-type prover. Note that the tank itself should be isolated from the effects of piping weight, rain, and wind.

The system may be equipped with vaporization control by installation of spray facilities for saturating the internal atmosphere in an open tank or may even employ a tank closed to the atmosphere, where the gas-displacement, vapor-displacement, or vapor-condensing methods of vaporization control are used.

The gravimetric prover requires that the gravity of the metered liquid be determined accurately. The most popular gravity determination is by means of hydrometer, although many operators are using the Westphal balance and pycnometer.

For high-vapor-pressure liquids, the pressure hydrometer, pycnometer and modified - gallon - bottle method are used most frequently. The items to watch in this gravimetric method are apparent and true weights, air-buoyancy effect which involves determination of air density, maintenance of scale accuracy, windage problems on the scale and the difficulties of determining the accurate specific gravities of high-power-pressure liquids like propane and butane.

Open Volumetric Provers

The volumetric method of meter proving is in greatest favor in all branches of the petroleum industry. Fig. 3 is basic and probably the most

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frequently performed open-prover type of meter proof.

The filling-station meter and pump system operating in the range of 3 to 10 g.p.m. is proved into a standard, very accurately calibrated 5-gal.-capacity open test measure of the type shown. The measure is first filled and then emptied to wet the walls and to provide an internal atmosphere which has vapor in it as does the gas tank of an automobile.

Such measures are always calibrated to "deliver" rather than to "contain" and this should be true of all volumetric meter provers. After wetting, the pump meter register is zeroed and a 5-gal. delivery made to the test measure in a manner identical to that of a 5-gal. delivery to an automobile.

The gaged volume in the test measure or prover must fall within the governing weights and measures laws. Several repetitive runs or adjustments are made in this manner until the delivery is within the specified tolerances. Although this type of prover should be limited to meters delivering 10 g.p.m. or less, the procedure of use is typical for most open-type volumetric provers.

Portable open-type volumetric provers are in common usage and Fig. 4 illustrates the popular 50-gal. size used in proving truck-delivery meters, small bulk-plant-type meters, and others. This prover is brought to the site of the meter, leveled up carefully with jackscrews and filled with liquid through the meter to wet its walls.

The prover is then emptied, usually with a suitable built-on pump. With the internal atmosphere full of vapors of the test liquid, a sufficient series of test runs is made to establish the meter within the proper tolerances.

Provers of this particular size and type should be considered only for trucks equipped with pumps delivering not in excess of 50 g.p.m.

Proving by this open-tank method on motor gasolines usually does not provide adequate control of test-liquid vaporization for meters used in a closed-line delivery system, but the method is a common one in spite of this fact, and portable provers of this general type are built in sizes up to 500 and 1,000-gal. capacities.

The permanently installed volumetric prover of Fig. 5 may be of either the open or closed type depending upon the liquid involved and the degree of test-liquid vaporization control desired. Such tanks are usually of the 250 to 2,500-gal. size and are usable to prove meters operating at rates which will fill the prover in 1 to 2 minutes. This particular prover holds 1,000 gal. and is used to prove truck-loading rack meters at around 500 g.p.m.

THOUSAND-GALLON open-type meter prover is equipped with top spray for vaporization control. Fig. 5.

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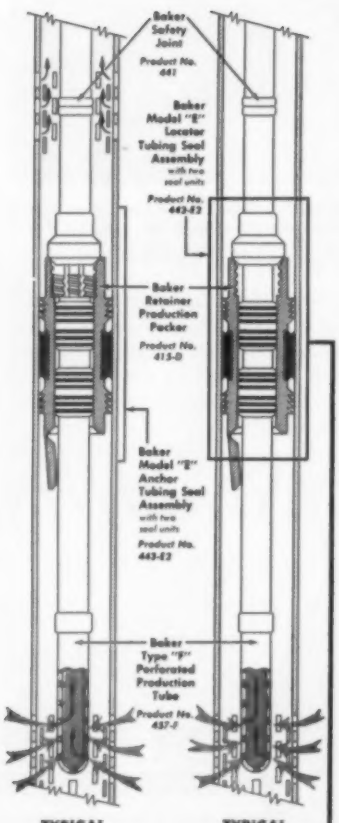
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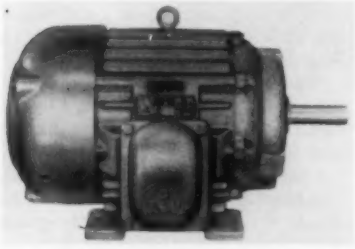
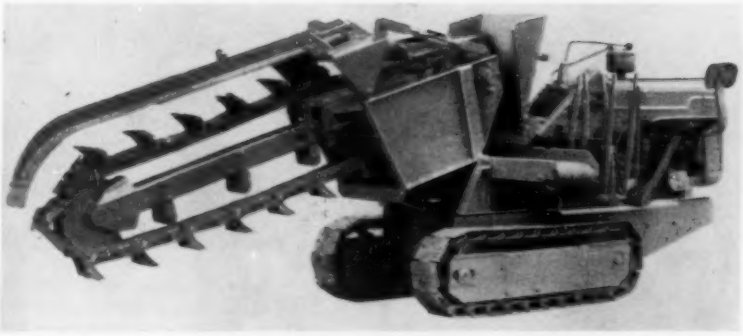
The motors are expected to find wide application in refineries and petrochemical plants and gasoline and gas-handling facilities.



The Type KZCX, explosionproof, fan-cooled motors are made in ratings of 1½ to 30 hp. Through the cooling system, trapped air within the motor enclosure is transferred by rotor action to the frame and bearing-arm surfaces. A cooling-air stream supplied by an external aluminum fan is directed by a fan shield over the motor surface to dissipate heat. The air stream is confined close to the surface of the motor to eliminate hot spots and prevent accumulation of dust and dirt. Numerous small openings on the air intakes provide ample cooling air.

The Type KZEX explosionproof nonventilated motor is made in 1½-hp. ratings and lower. It is cooled through convection and natural radiation by rotor action and a large ratio of frame-surface area to volume. Except for the absence of an external fan and fan shield, this model is identical in construction to the Type KZCX motor. **Write or call: Fairbanks-Morse & Co., Beloit, Wis., for details on explosionproof motors.**



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According to the maker, low maintenance is a feature of the crane. This is said to be due primarily to the fact that the motors and gears are located directly at all work points, eliminating mechanical drives, torque converters, and a transmission system. The maker's standard crane uses an a.c. motor for its swing drive. But a d.c. motor is optional for more precise handling of heavy materials.

The crane carries a rating of 300 ft.-tons. This rating indicates the crane will lift 25 tons at a minimum boom radius of 12 ft. Boom lengths range up to 80 ft. **Write or call: R. G. LeTourneau, Inc., 2399 South MacArthur, Longview, Tex., for details on electric deck crane.**

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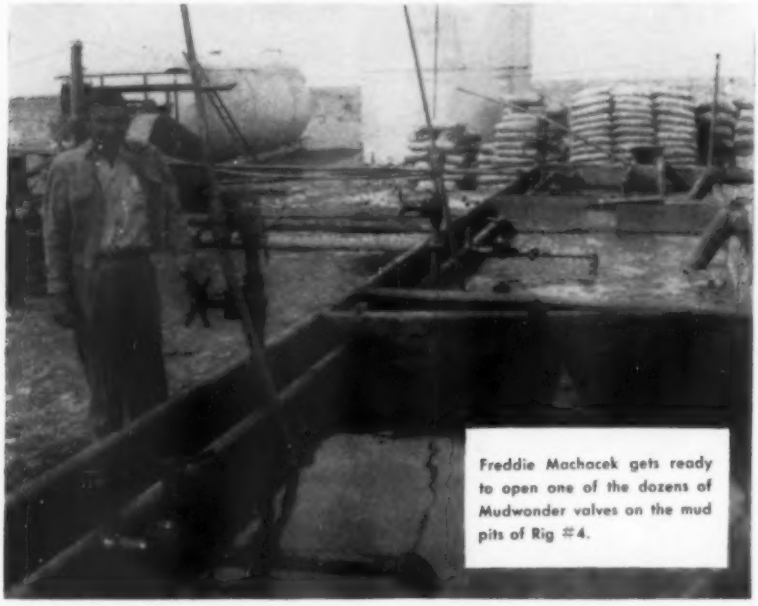
Tips on Mud Valves for Toolpushers . .



Freddie Machacek gets ready to open one of the dozens of Mudwonder valves on the mud pits of Rig #4.

MUDWONDER Ideal for Versatile Service

by Freddie Machacek, Toolpusher, Rig #4
B.B.M. Drilling Company, Midland, Texas

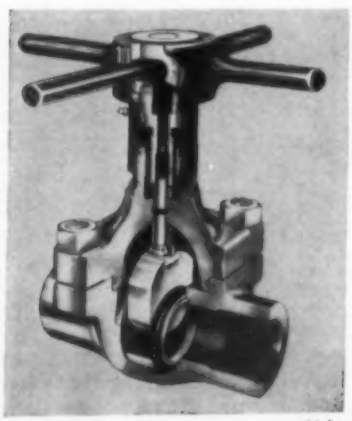
About two years ago I put a *Mudwonder* valve on our fill-up line just to see how it would make out. I soon found that *Mudwonder* worked fast and easily, without binding, even while bleeding off the line at 1600 lbs pressure. It did so well I tried more *Mudwonders* on the tough job of mud pit service—and they were so successful I've standardized on *Mudwonder* ever since!

Valves on mud guns and jets take a terrific beating, but we've had very little trouble with *Mudwonders*. As a matter of fact, our first ones are still in service; we replaced the stem packing on one valve—that's all! Because replacement parts are so easy to identify, we never have any trouble getting the exact part we need. In fact, the valves are designed to use the same seat and gate for both pressure classes.

When we have to dress a *Mudwonder*, the job can be done without disturbing any connections. The valve is out of service only about 10 minutes, start to finish, regardless of size. Another thing—they never sand up. Bob Lawrence, Edward *Mudwonder* Representative, says this is because the design causes the mud to flush the bonnet automatically.

Mudwonder valves are available in 2″, 3″ and 4″ sizes; with screwed or flanged ends; rated at 2000 psi WP (4000 psi test) and 3000 psi WP (6000 psi test). See your favorite oil field supply store for complete information, or write Edward Valves, Inc., East Chicago, Indiana, subsidiary of Rockwell Manufacturing Company.

Mudwonder cut-away view shows the one-piece seat insert, with Buna-N molded integrally over steel wear rings; chromed gate with "T" slot connection; separated stainless stem and double thread construction.



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New Equipment

Hand Vibrograph Records Machine Vibrations

Weighing only 3¾ lb., the Askania hand vibrograph is suitable for measuring mechanical vibrations of machinery and vehicles as well as such component parts as shafts and springs. Built for a frequency range from 0 to 250 c.p.s., it is driven by its own clock work.

The time markers are operated by a built-in 6-volt battery. The instrument uses no ink. It records by stylus on a waxed-paper tape. The amplitude range is from 0.00001 up to ⅜ in.

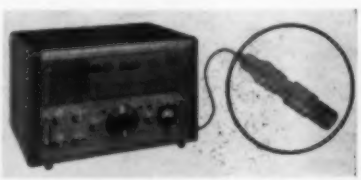
Accessories available allow the instrument to be used to measure torsional vibrations on shafts and pressure vibrations of liquid or gas-carrying pipes. **Write or call: Epic, Inc., 154 Nassau Street, New York 38, for details on Askania hand vibrograph.**

●

Engine Analyzer Measures Pressure and Vibration

Engine pressure, vibration, and ignition voltage can be measured directly with this new SLM engine indicator-analyzer, Series EA-114. It is said to be ideal for trouble shooting, diagnosing, monitoring, and adjusting high-speed, high-compression engines in pipeline stations.

A Swiss-made, quartz-crystal pressure gage (pickup) is the heart of the system. When used with various accessories and adaptors, it displays engine functions on an oscilloscope screen. Cylinder, manifold, fuel-injection, and detonation pressure, com-



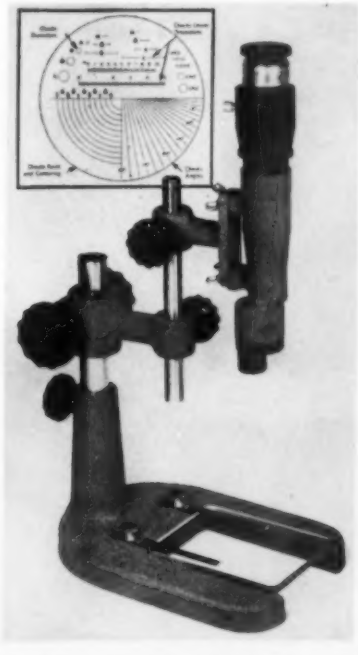
bustion-pressure rates, engine vibrations, and crankshaft torsional vibration can be alternately shown and precisely measured.

The transducer system is used also to adjust timing and check peak cylinder pressures, load distribution, valve operation, preignition, and knock. When used to measure cylinder pressures, the pressure gage mounts in a modified spark plug, a special indicator port, or in place of the fuel injector. It will withstand combustion-gas temperatures up to 3,200° F. without special air or water cooling. **Write or call: Kistler Instrument Corp., 15 Webster Street, North Tonawanda, N. Y., for Bulletin EA-114.**

•

Microscope Gives Measurements Directly

This optical measuring tool utilizes a pocket comparator at the eyepiece end to project an image of the reticle pattern directly on the work. Thus the operator reads exact measurements directly from the reticle.



The instrument provides a 6-in. working distance between the objective and the object in view. The viewer sees an erect image. Many uses for the instrument are possible. It can be valuable to check linear dimensions, diameters, radii, and angles. Linear dimensions are given both in inches and millimeters.

The reticle of the comparator is precision etched for dependable, accurate performance. The direct-measuring microscope, complete with comparator, lists for $94.50 postpaid. **Write or call: Edmund Scientific Co., Barrington, N. J., for details on direct-measuring microscope.**

•

Front-End Winch Will Pull 15,000 Lb.

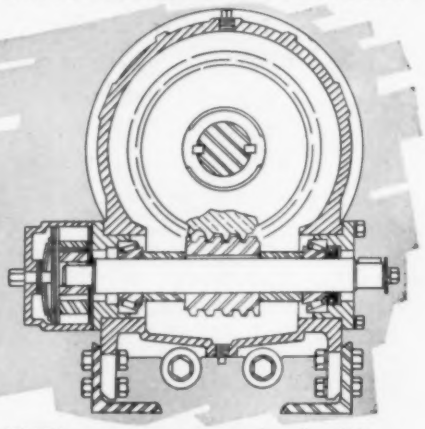
Easy installation and disassembly are featured by this MU7-16F front-end winch. All parts bolt together. No special tools are required for installation. According to the maker, the winch is designed to operate and

give excellent speeds for the pull as the winch line builds up on the drum during operation. The winch is so designed that all parts work together so no one part takes all the stress.

One feature of the winch is its ease of disassembly. Only one small hand wrench is required. The winch can

BRADEN TRUCK WINCHES

Here's Where QUALITY Tells . . .



The BRADEN worm gear is made of solid bronze alloy (on light and medium duty models), and solid bronze alloy cast around solid steel hub (on heavy-duty models). The shell type worm is made of hardened and ground, special treated alloy steel.

These two gears, the heart of the mechanism of the winch, are engineered to give an extra margin of safety should the operator load the winch beyond its rated capacity.

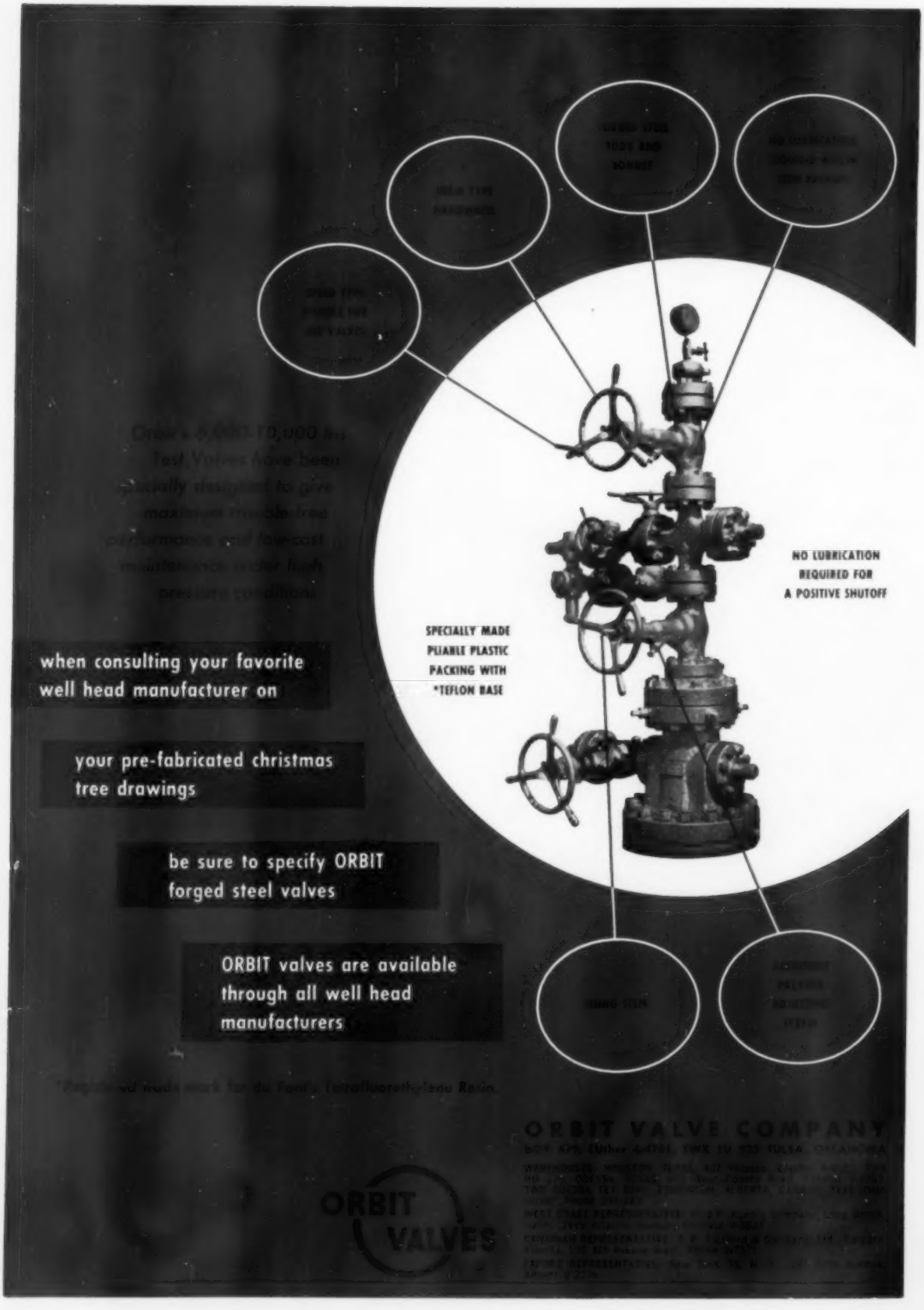
BRADEN Truck Winches are made in capacities from 6,000 to 100,000 pounds. Specify BRADEN Winches . . . and be sure!

WRITE FOR CATALOG

BRADEN WINCH COMPANY
P. O. Box 547, Broken Arrow, Oklahoma

BRADEN Winches

In service around the world


NO LUBRICATION
REQUIRED FOR
A POSITIVE SHUTOFF
SPECIALLY MADE
PLIABLE PLASTIC
PACKING WITH
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when consulting your favorite
well head manufacturer on
your pre-fabricated christmas
tree drawings
be sure to specify ORBIT
forged steel valves
ORBIT valves are available
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manufacturers
ORBIT VALVE COMPANY
ORBIT
VALVES

New Equipment

be removed from the truck and disassembled in a few minutes.

Gear ratio of the winch is 30:1. It weighs 234 lb. Operating at full cable-drum capacity, the drum will take 330 ft. of ½-in. rope, 260 ft. of ⅜-in. rope, and 210 ft. of ⅝-in. rope. **Write or call: Braden Winch Co., Box 547, Broken Arrow, Okla., for Bulletin MU7-5705.**

●

Transformer Provides Reduced Voltage

From 200 to 400 watts of grounded illumination in a choice of 6, 12, or 32 volts is supplied from a conventional 110/120 volt a.c. power source by this low-voltage lighting set. It is reported to be absolutely safe to use around metal structures, even in dripping-wet conditions.

The set consists of a circuit-breaker-protected stepdown transformer housed in a moisture-tight, cast-aluminum case with one through four handlamp extensions that plug into receptacles on each end of the carrying case. It is supplied with a 6-ft. power extension and a male plug that connects to conventional-style (3-contact) grounded female receptacles. A third wire in the extensions connects the ground to the transformer case and to the metal lamp guards.

The handlamps accommodate screw-in style, medium-Edison-base bulbs in 50 and 75-watt sizes for 8 and 12-volt sets and 50 and 100-watt sizes for 32-volt sets. **Write or call: Depart. V-115, Joy Mfg. Co., 1201 Macklind Avenue, St. Louis 10, for Flyer F45.**

almost

To handle any lifting job... twelve dependable Duff-Norton Hy-Power Hydraulic Jacks capacities 3 to 100 tons

Rugged and dependable, Duff-Norton Hy-Power hydraulic jacks are available in a wide range of sizes for all kinds of lifting jobs—in all types of industries. Manufactured with care from the finest materials, they will function smoothly for many years with a minimum of maintenance. Heads may be brought up to load height quickly, saving the operator's time. For full information on these outstanding jacks, see your favorite supply store or write the world's oldest and largest manufacturer of lifting jacks, asking for Bulletin AD-16-B.

DUFF-NORTON COMPANY

P. O. Box 1889 • Pittsburgh 30, Pennsylvania

COFFING HOIST DIVISION • Danville, Illinois

DUFF-NORTON JACKS
Ratchet, Screw,
Hydraulic, Worm Gear

DUFF-NORTON

COFFING HOISTS
Ratchet Lever
Spur Gear, Electric

WHIP DOWNHOLE MILLING COSTS WITH KINZBACH SPEEDMILLS

TYPE 155

Continuously renewed multiple cutting edges, in optimum arrangement with tool shape, work contact areas, flushing passages, and other factors combine to make Kinzbach Speedmills highly efficient for downhole metal cutting operations.

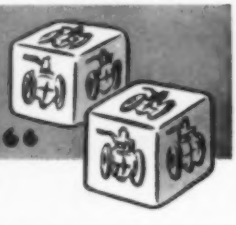
Kinzbach Speedmills cut rapidly, leave clean work surfaces, and may be run under severe weight and speed conditions.

Types available for every downhole milling problem.

KINZBACH TOOL CO., INC.
P. O. Box 277 • HOUSTON, TEXAS
EXPORT: 74 TRINITY PLACE, NEW YORK, N. Y.

KINZBACH TOOL CO INC

THEY'RE A Natural....

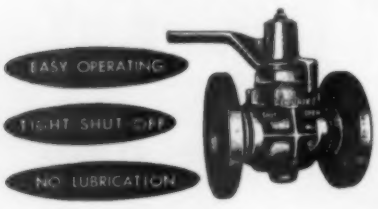


For Natural Gas!

DeZurik Valves have *exclusive* features which make them the ideal valve for natural gas service. Check these advantages!

1. **ABSOLUTELY NO LUBRICATION NEEDED!**
2. **DEAD-TIGHT SHUT-OFF!**
3. **EASY ¼ TURN FROM OPEN TO CLOSE!**
4. **TIGHT SHUT-OFF UNAFFECTED BY SOLID PARTICLES IN THE FLOW!**
5. **LARGE PORT AREAS FOR MINIMUM FLOW RESISTANCE!**
6. **AND THEY'RE ECONOMICALLY PRICED!**

You can't buy a *better* valve for natural gas service!

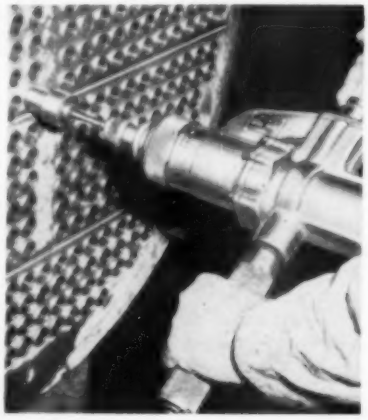


In sizes ½" thru 20", a full range of materials and operators. Representatives in all principal cities, or write to

DeZURIK CORPORATION
SARTELL, MINNESOTA

Tube Expander Eliminates Guesswork

Pneumatically operated, the Airetrol expander has a tube-expansion control that automatically regulates tube expansion by accurate measurement of torque. It rolls up to 12 tubes per minute to uniform accuracy. To eliminate guess work in tube rolling, the maker combines a rugged air-motor drive with a precision control to measure torque output.



Accurate to 0.001 in., the control automatically stops expansion according to a predetermined setting. The result is uniformly tight tube joints with no over or under expansion. The torque-sensing mechanism is unaffected by fluctuations in air pressure. A primary benefit cited for the tube-expansion control is that it insures maximum tightness and holding strength in every tube joint in a condenser or heat exchanger. It prevents distortion or breakage of ligaments in tube sheets.

The finger-tip micrometer adjustment is quickly set to the desired torque without using tools. A calibrated ring permits torque settings from 0.5 to 37 lb.-ft. of torque at 90 psi. **Write or call: Airetool Mfg. Co., Springfield, Ohio, for Bulletin 64.**

●

Stainless-Steel Fittings Take 2,500 Psi.

The cast stainless-steel fittings, designed for services to 2,500 psi. at 670° F., are available in both 300 and 400 alloy series in sizes of 8 to 30 in. They include 45° and 90° elbows, tees, and reducing fittings. They meet the quality controls required for petrochemical plants, the maker reports. **Write or call: Cooper Alloy Corp., Hillside, N. J., for details on stainless-steel fittings.**

Last year, National Supply representatives drove more than 20,000,000 miles to serve the industry.

It's the service beyond the sale that counts!

The man who travels your area in the National Blue car is very interested in your progress. Just to "make a sale" isn't enough for him. He wants to be sure that you're satisfied with the equipment and supplies you've bought from National. He wants to know your operating problems—and do whatever he can to help you solve them.

You'll find this attitude toward service beyond the sale a big day-to-day help—and you'll find it wherever you do business with National Supply. Remember, however, that the National field man is just a part of this service. Experienced and capable as he is, he cannot possibly provide *all* the service and information available in the modern store out of which he works.

So, to get the complete benefits of National Supply service, it will pay you to stop and shop frequently at National Supply Stores. We have 130 of them in the United States, Canada and Venezuela. If you haven't been in one for a while, you're due for some pleasant surprises.

Precision manufacturing operations and painstaking inspection methods insure the traditional quality in every finished National Rod shipped to the field.

Why you get low-cost sucker rod service with a National string

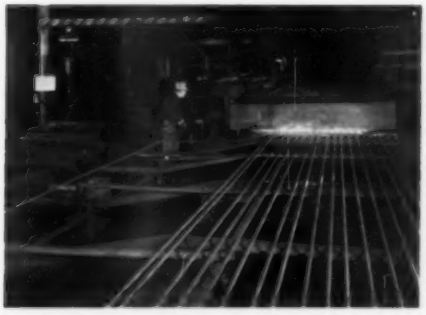
There are three main reasons. National Sucker Rods are:

1. **Engineered** for maximum resistance to shock, corrosion, fatigue and impulse loads;
2. **Quality-controlled**—from laboratory testing of sucker rod steels to final shipment inspections—to give you the ultimate in uniformity, dependability and economy!
3. **Precision-manufactured** on specially-developed machines—in accordance with the strictest specifications in the industry.

National Rods reach you in factory condition, too, whether you get them from National Supply Store stocks or directly from the mill. National's careful methods for stacking, handling, shipping and field storage have been proved by hundreds of shipments to all parts of the world.

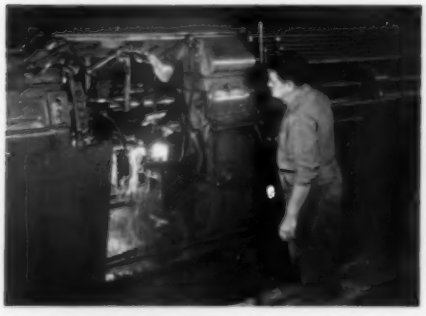
Of course, National has a rod grade for every well condition—normal, mildly corrosive, heavy corrosive or sulphide wells. For wells with high paraffin content, or certain dual-zone pumping installations. National Hollow Sucker Rods are available in various grades and sizes. You can also get National Plastic-Coated Rods to slow paraffin accumulation and have special protection against corrosive fluids.

From any standpoint, the choice of a National Sucker Rod string means low-cost sucker rod service. You'll find it worthwhile to review your rod needs with the National Supply field man in your area.



To obtain uniform structure and strength, National rod ends are upset in an engineered series of progressive forging operations.

National's continuous automatic heat-treating furnaces refine grain structures and remove residual strains due to rolling and forging.



Precision threading insures the easy make-up of National strings. Rod and coupling threads are carefully gauged for positive seating.

National Rods are protected by a tough coat of special enamel. In addition to other grade markings, a color brand is applied for easy identification.

More National equipment for profitable production on the next page

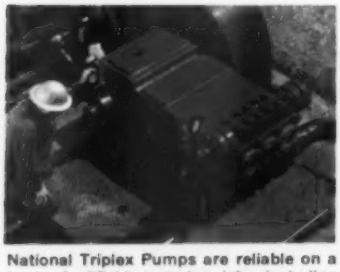
National Pumpers are available in 22 standard API sizes, plus various long stroke and portable variations.

You get low-cost production with National Pumpers!

That's because National units are as rugged and dependable as modern engineering and manufacturing can make them! Every feature and part has been designed to give you low-cost service with a minimum of maintenance. Here are a few examples:

- Extra strong main base with maximum rigidity and counterweight clearance to insure quick, easy floor level installation.
- Tough, hard alloy steel gears and pinions—gear train mounting and main bearings permit lower shaft loading and deflection—easily handles shock loads resulting from load reversals.
- Stable, well-balanced samson post —rigidly cross-braced, built to distribute beam load evenly over entire foundation area.
- Simple Pitman components assure positive alignment and correct fitting—are easily field-serviced.
- Extra heavy duty walking beam and beam hanger for long, continuous service.

Get all the facts on National's complete line of Pumping Units today. New bulletins describing these quality units are available at the National Supply Store or from National Representatives in your area.



National Triplex Pumps are reliable on a host of oilfield pumping jobs including waterflooding, salt water disposals, formation fracturing, and as power-oil sources for subsurface hydraulic pumps.

National Wellhead Equipment features interchangeable units which provide many combinations for your specific size, capacity and type needs. Ease of assembly and pre-tested safety are two of its outstanding advantages.

National Plunger Lift can be the best production method for certain types of wells. It uses formation gas or injected gas for operation, has low initial and service costs. Equipment is also available for gas well operation to remove liquids and maintain a uniform and increased flow rate of gas.

THE **NATIONAL SUPPLY** COMPANY

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Pa.
DIVISION OFFICES: Dallas; Denver; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; City Wall House, Chiswell Street, London E. C. 1

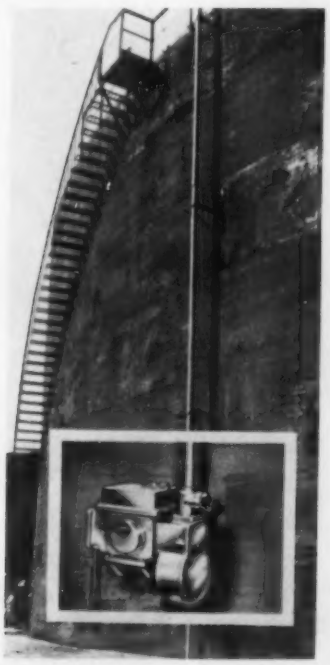
NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

SHOWCASE . . .

New Equipment

Electronic Tank Gage Measures Levels at 250 Psi.

The improved model of the Gilbarco electric tank gage is now housed in one small explosionproof housing instead of two. It weighs 120 lb. less and is installed with a 2½-in. standpipe instead of the 4-in. pipe formerly required. This, together with simplified wiring, reduces installation expense by almost 50 per cent, the maker reports.



The improved model has been designed to gage liquid levels in pressure tanks up to 250 psi. as well as atmospheric vessels to which the original gage was limited. It can also be used to measure levels in underground cavern storage to a depth of 1,000 ft.

A modification of the new model is also available with a special sensing element for continual measurement of the interface of petroleum products and water. The temperature range has been increased to handle products to 175° F. With minor gage modifications, product temperatures can be measured up to 425° F.

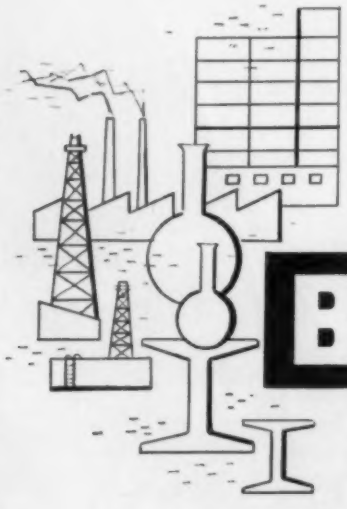
The gage is accurate in the field to within ⅛ in. Continuous readings of liquid levels in feet, inches, and sixteenths can be taken at the tank site, as well as remotely, if desired. Other features of the new model include a plug-in jack for sound-powered phones, automatic temperature selection of averaging resistance bulbs, and high and/or low-level alarm signals. **Write or call: Gilbert & Barker Mfg. Co., West Springfield, Mass., for details on tank gage.**

●

Centrifugal Pump Is Elastomer Lined

Eight sizes of the centrifugal pump are available with linings of natural rubber, Neoprene, and Hypalon. The elastomer-lined pump is designed to replace special pumps constructed of costly or dangerously fragile alloys used in handling mixed acids and abrasive slurries. The mechanical seals and packed stuffing boxes employed are interchangeable.

The pump is available from stock in eight capacities ranging from a 1 by 1-in. size rated at 30 g.p.m. at a 20-ft. head to a 2 by 2-in. size rated at 200 g.p.m. at an 85-ft. head. Also available are circulating pumps with capacities to 400 g.p.m. at 50-ft. head at 1,750 r.p.m. **Write or call: Ampco Metal, Inc., 1745 South Thirty-eighth Street, Milwaukee 46, for details on elastomer-lined pumps.**



INVESTMENT
SEVEN
BILLION
DOLLARS

Since 1948 seven billion dollars have been expended in public and private investments in the Province of Alberta, Canada.

Alberta's natural resources have opened the door to hundreds of diversified manufacturing plants. The investment in manufacturing alone has been $653,800,000.

The advent and development of the oil and gas industry has given impetus to manufacturing in one of Canada's richest provinces.

The advance of the manufacturing industry is just one example of the tremendous growth of Alberta where natural gas is available as a fuel and a raw material for many petroleum industry by-products.

The Industrial Development Branch of the Government of Alberta will prepare complete reports on markets, sites, materials, transportation, etc., and individual surveys on a confidential basis on request without charge.

For further information on the opportunities to establish your industry or business in Alberta write:

Richard Martland, Director, Industrial Development Branch,
Legislative Building, Dept. T.O.J.58 Edmonton, Alberta, Canada.

GOVERNMENT OF
ALBERTA
DEPARTMENT OF ECONOMIC AFFAIRS

Hon. A. Russell Patrick, Minister
Ralph R. Moore, Deputy Minister

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*Office only. No stock at these points.

ECO

FOR COMPLETE *DRILLING HARMONY*

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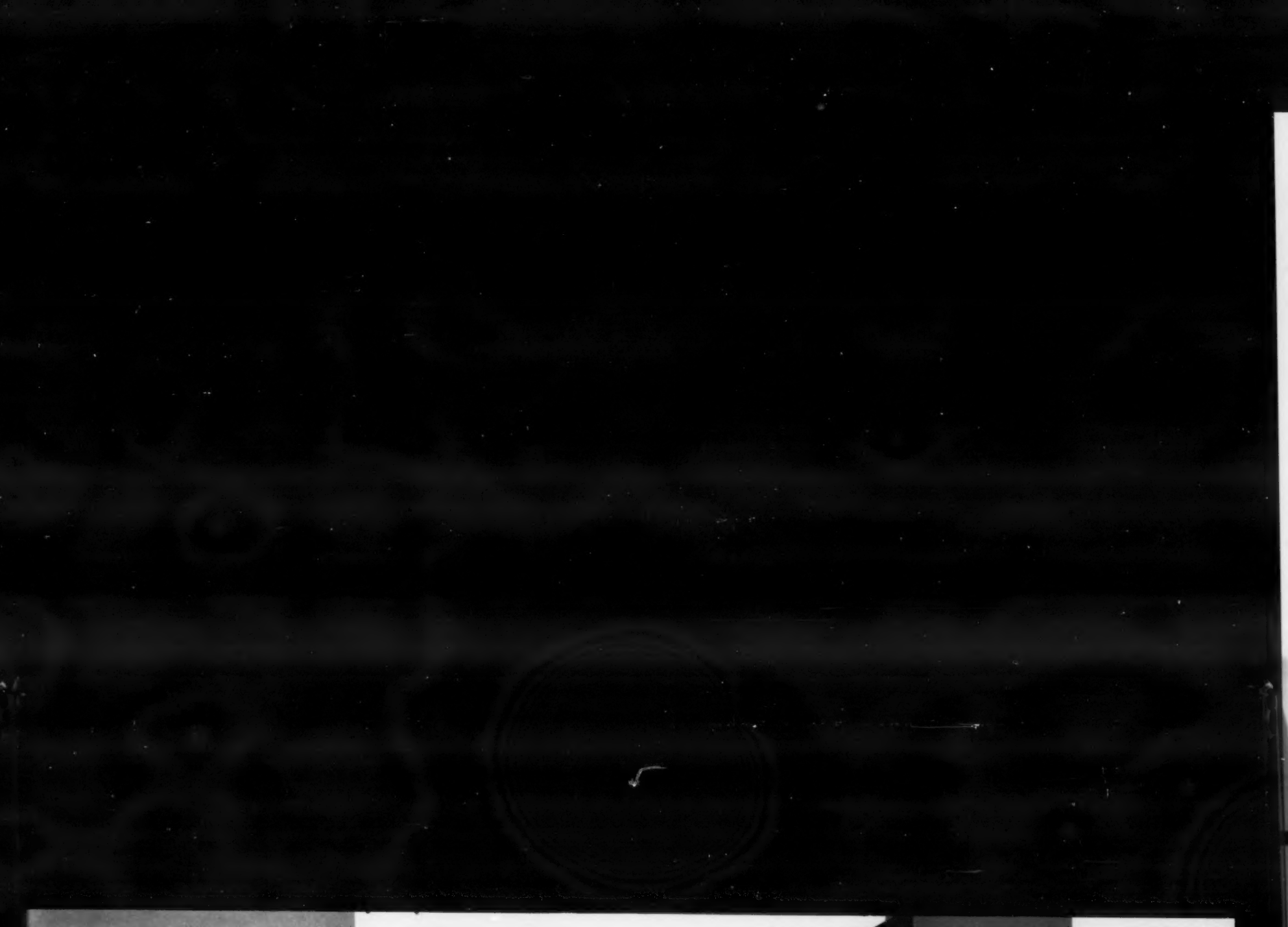
WORLDWIDE



Cut Shallow-Well Drilling Time With the

GB-250-T Rig

Continental-Emsco GB-250-T Rigs can be powered by one or two engines up to 300 hp. Drum line capacity is 11,090′ with 5/16″, 9,030′ with 3/8″, 6,230′ with 1/2″ and 3,520′ with 1″.

Designed for Workover, Well Servicing and Shallow Drilling

FASTER MOVES.. this compact rig is completely unitized. Drawworks.. engines.. drives are all mounte on a common skid base.

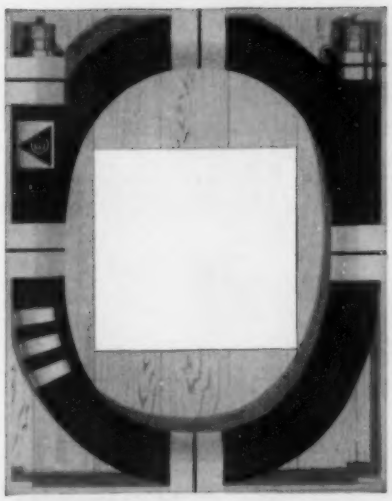
FASTER RIG OPERATION.. torque converter dri assures speedier round trips, quicker starts and faster acceleration.. with precision control when needed.

FASTER, RESPONSIVE CONTROLS.. modern, quick-reacting controls are grouped at the drille finger tips. He has complete control of the rig at all times with a clear, unobstructed view of entire rig operation. Direct air-operated clutches speed up drilling.

for Service

Check the complete line of Continental-Emsco rigs.. there's one to fit <u>your</u> drilling requirements.

3-BAND
GREEN TRIANGLE
ROTARY HOSE



The one hose that exceeds API specifications
. . . meets all high-pressure drilling needs

NEW YORK BELTING & PACKING CO. • Founded 1846

As the oil country's highest quality rotary hose, 3-Band Green Triangle Rotary Hose is rugged, flexible and always *quickly available* from your Continental-Emsco Store.

A *downtime-eliminating feature* of this hose is its one-piece full-hole coupling, firmly embedded in the hose as *an integral part*. This coupling is completely leakproof under any drilling condition, because as the pressure increases, the seal tightens. It is streamlined . . . no flange, nozzles, bolts, nuts, clamps, or hydraulic nipples have to be *installed, checked or tightened*.

Standardize on 3-Band Green Triangle Rotary Hose . . . available through every Continental-Emsco Store.

e that Sings..

For lower-drilling-cost information on rotary hose use . . send for your free copy of "Extending Rig Hose Service."

READY TO ROLL!

Yellow Strand®

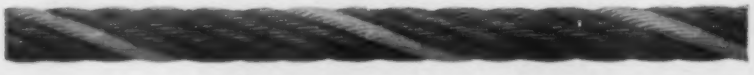
"POWERSTEEL"

"POWERSTEEL" wire rope is *ready to roll* . . from any one of the completely stocked Continental-Emsco stores located throughout the world's oil fields. This makes it possible for you to standardize on this higher strength wire rope . . and still be assured of an adequate supply when you need it . . regardless of where you move your rig.

Ask for Yellow Strand "POWERSTEEL" today . . your order is always *ready to roll.*

Equipment

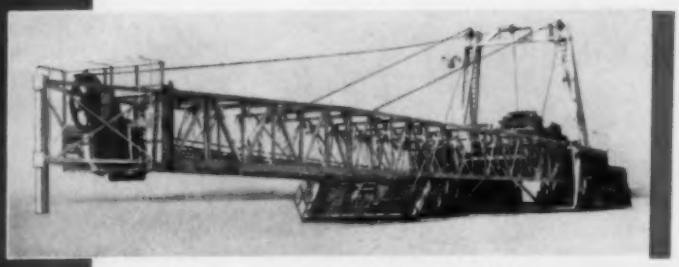
Lift Here for Drilling Rig and Rotary Hose



Rig-Up Fast with
Low-Level Assembly

CONTINENTAL-EMSCO

B-Series Portable Masts



It's easy to assemble a B-series mast at low level. Crews work faster . . safer. The rear legs of the mast are pinned to the substructure and pivot as the mast is raised. No auxiliary raising equipment is needed, so the mast is up fast . . the well is spudded in sooner.

Once the mast is raised, an exclusive, built-in leveling system makes it simple to center the crown block over the well.

Four-leg design and truss-type mast construction are used for maximum strength and rigidity . . permit mast to be transported as a single compact unit. Open-face design and interior bracing provide clear visibility of the racking platform for the driller and allow maximum working room for traveling block, swivel and rotary hose.

Continental-Emsco B-Series masts are constructed to API specifications . . carry an API monogram. B-Series masts are also adaptable to barge and platform installations.

t that Hums

Ask your Continental-Emsco man about the many other features built into these masts . . features that also help cut drilling costs.

Safe, sure and straight-falling

CONTINENTAL-EMSCO TRAVELING BLOCKS

Perfectly balanced Continental-Emsco "RA" Series traveling blocks are fast-falling and slim-lined. Safe to operate, sturdy and easy to reeve, they have a low center of gravity that eliminates canting.

Sheaves of fine-grained forged steel are stronger and longer-lasting . . sheave rims wear evenly and smoothly. Sheave grooves are flame-hardened to reduce wire line wear.

If it's new . . you'll find out about it at

YOUR CONTINENTAL-EMSCO STORE

Oil folks have a habit of dropping by their Continental-Emsco Store whenever they're in town. They know it's a good place to catch up on the oil field news.

They like to look over all the new equipment . . discuss it with their friends . . talk about new ways to do old jobs better. They especially appreciate the friendly atmosphere that always makes them feel welcome. They like to relax in a comfortable spot and read the latest bulletins on equipment . . look at the used equipment list.

Why don't *you* make a visit to your Continental-Emsco Store a regular habit when you're in town.

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Serving the Oil and Gas Industries ... Worldwide

CONTINENTAL-EMSCO COMPANY • A Division of The Youngstown Sheet and Tube Company • General Offices: Dallas, Texas
Export Division: 45 Rockefeller Plaza, New York, N.Y. • Continental-Emsco Company Limited • General Offices: Calgary, Alberta, Canada
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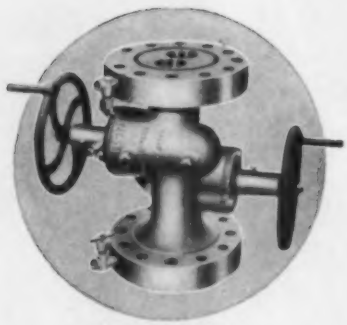
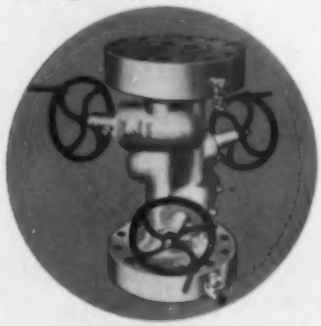
..Go CONTINENTAL-EMSCO

There's an "RA" Block the right size for your rig, as well as a companion crown block. See your Continental-Emsco man.

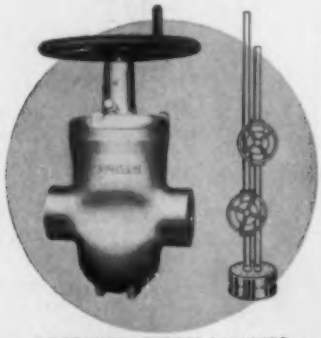
V730R



DUAL VALVES
Sizes: 1½" x 1½", 1¾" x 1¾", 2" x 2", 2½" x 2½", 2" x 2½" and 2½" x 3".



TRIPLE VALVES
Size: 2" x 2" x 2".



RECESSED BODY VALVES
Sizes: 1½", 1¾", 2", 2½" and 3". Right Side or Left Side Recessed as ordered.

The same efficient flow control provided by standard W-K-M Through-Conduit Gate Valves is available for multiple completions with the W-K-M Dual, Triple and Recessed Body Gate Valves.

These valves provide turbulence-free through-conduit flow, W-K-M's exclusive CONTROLLED FORCE SEATING, DOUBLE-TIGHT SEALS* at both upstream and downstream seats and all the other important advantages of W-K-M standard valves.

Specify the W-K-M Dual and Triple Completion Valves for the most efficient trees. Where economy is paramount, specify the W-K-M Recessed Body Valve . . . identical internally with standard W-K-M Valves, but with a body recess to allow the necessary close fit between tubing strings.

W-K-M
DIVISION OF acf INDUSTRIES INCORPORATED

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MAILING ADDRESS: P. O. BOX 2117, HOUSTON, TEXAS

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*PAT. PENDING. © 1957, ACF INDUSTRIES, INCORPORATED.

Write Dept. A-224 for Bulletin WP 1057 for full information on W-K-M Valves for multiple completion. For complete details on W-K-M oil field valves, ask for Catalog 200.

MANUFACTURERS OF W-K-M GATE VALVES · ACF LUBRICATED PLUG VALVES · KEY-KAST ALLOY STEEL PIPING FITTINGS · KEY RETURN BENDS AND FITTINGS

5726

SHOWCASE . . .

New Literature

Elevating scrapers . . .

bulletin details equipment available in 5, 8, and 11-cu. yd. capacities. The scraper features an elevator mounting which does not depend on gravity or the weight of the elevator, according to the maker. Instead, it provides a positive means for applying any desired pressure to the lower end of the elevator. This forces the elevator slats to bite into the soil which has been cut and carry it to the scraper bowl. The dumping mechanism is designed to eliminate compaction of material during the dumping process. The bulletin lists detailed specifications on each model. **Write or call: Johnson Mfg. Co., P. O. Box 1674, Lubbock, Tex., for Elevating-Scrapers bulletin.**

Tubing pumps . . .

are described in a new four-page bulletin. These pumps are for pumping operations that require large volumes of fluid to be moved on a continuous schedule. The basic barrel assembly consists of a top and bottom collar, jacket, and one-piece, alloy-steel liner. Below the bottom collar is the extension nipple and shoe. The cages have induction-hardened guides to provide resistance to abrasion and streamlined fluid passages to reduce turbulence. **Write or call: National Supply Co., 2 Gateway Center, Pittsburgh, for details on tubing "full-liner" pumps.**

Gas-distribution filters . . .

for control of pipeline dust are described in new Bulletin 7. A companion bulletin, 7A, covers the handling of liquid-gas separation in the line. The dry-cleaning process discussed in Bulletin 7 is based on a filter-tube bundle which consists of tubular filter elements mounted on a central collector plate. These filter elements are seamless tubes formed from a resilient, fibrous, inorganic filter medium and are mounted on a heavy, removable, perforated-metal core. **Write or call: Perry Equipment Corp., Mineral Wells, Tex., for details on Peco gas distribution-line filters.**

135-ft. diameter sphere . . .

construction is detailed in a 16-page bulletin. The sphere was designed, fabricated, and erected by Motherwell Bridge & Engineering Co., Ltd., for the Atomic Energy Authority of Great Britain. The shell-plate thickness of the sphere ranges from 1 to 1⅞ in. The sphere weighs 1,500 tons and its surface area is 1½ acres. The company also builds cylindrical oil-storage tanks of all sizes in welded, riveted, or bolted designs, as well as tanks in specialized shapes. **Write or call: Motherwell Bridge & Engineering Co., Ltd., Lanarkshire, Scotland, for bulletin on 135-ft. sphere construction.**

Wheel-type trencher . . .

that features a hydraulically driven conveyor giving belt speeds up to 600 ft. per minute, completely independent of digging speeds, is described in a new bulletin. The Model 170 trencher also has a hydraulic-tilt mast design which holds the wheel mast in a vertical position for digging, the bulletin says. It will dig 5 ft. 9 in. deep and from 20 to 32 in. wide. **Write or call: Parsons Co., Div. of Koehring Co., Newton, Iowa, for Trenchliner bulletin.**

Engine indicator . . .

a combined electronic pressure indicator and engine analyzer, is described in Bulletin EA-114. Designed to measure internal-combustion engine pressures, ignition, and vibration, this instrument is useful for trouble-shooting, diagnosing, monitoring, and adjusting high-speed, high-compression engines, the maker says. Fully described and illustrated is the Swiss-made SLM quartz-crystal, pressure-gage pickup which, under pressure, generates an electric charge that is measured by an electrostatic amplifier and displayed on standard oscilloscope. **Write or call: Kistler Instrument Corp., 15 Webster Street, North Tonawanda, N. Y., for Bulletin EA-114.**

Centrifugal compressors . . .

designed for catalytic reforming are reviewed in a new bulletin, Form 8277. These compressors efficiently handle a wide volume range of low-density hydrocarbons used in the refining process, the maker says. They recycle the gases at relatively high pressure and are built in a wide range of sizes, according to the needs of individual installations. The units are built with either vertically or horizontally split casings. The vertically split casings can have either top or bottom intake and discharge, while the horizontally split casings have both connections conveniently located on

CONSERVATION IN THE PRODUCTION OF PETROLEUM

Erich W. Zimmermann

"Objectively discusses the many phases of a subject concerning which too often a misunderstanding of the facts and erroneous assumptions have led to unwarranted conclusions and criticisms."—*Robert E. Hardwicke.*

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Ralph Cassady, Jr.

"Recommended to oil men for study and to others who desire to understand a complex competitive situation about which there has been a woeful lack of understanding in high places."—*API Quarterly.*

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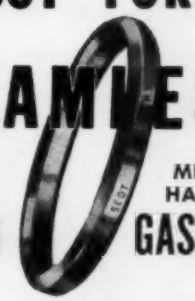

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For ring Groove Flanges forged from reforging billets in the following materials in stock: Soft Steel, Copper, Aluminum, Inconel, Monel, Nickel; 1¼ Cr ½ Mo., 2¼ Cr 1 Mo., 9 Cr 1 Mo. 304, 310, 316, 321, 347, 405, 410, 430, 502.

Machined in all A.P.I. — A.S.A. Special sizes and other type.

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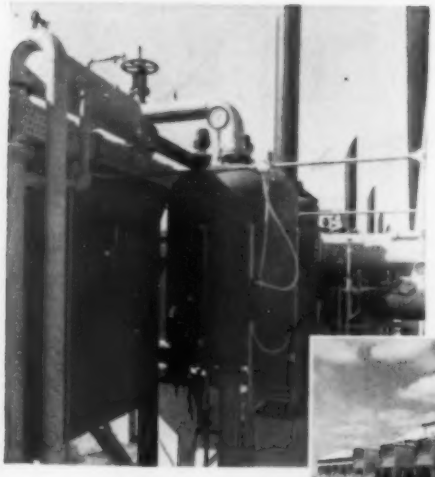
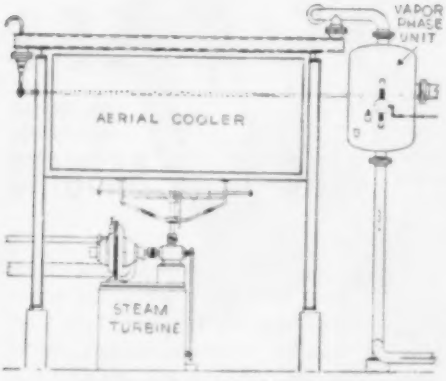
UNITED GAS PIPE LINE CONVERTS TO VAPOR PHASE®



Eliminates Engine Power for Driving Turbine Fan... Utilizes Power Cylinder Waste Heat

In January, 1954, United Gas Pipe Line Company installed Vapor Phase Thermal Circulation on five 880-bhp gas engine compressors at their Agua Dulce, Texas, gas compressor station.



During September, 1956, one fan-drive was converted to the Vapor Phase Steam Turbine Fan Drive (utilizing power cylinder waste heat as steam at 15 p.s.i.g. pressure), thus eliminating engine power formerly required to drive the fan for lube oil cooling and steam condensing.

"Sole Developers and Manufacturers of Vapor Phase® Thermal Circulation (Ebullition) Engine Cooling Systems."

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ENGINEERING CONTROLS Incorporated

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Los Angeles 27, Calif.

the bottom casing half. Special shaft seals are available. The driver can be a steam-turbine, combustion gas-turbine, or motor-gear combination. **Write or call: Ingersoll-Rand, 11 Broadway, New York 4, for Form 8277.**

Turbine-type flowmeter . . .

for bulk plants, pipelines, refineries, and petrochemical plants are described in new Bulletin IB-1. Advantages cited for the meter are a temperature range from —455° to 1,500° F. and unlimited operating pressures. Flow range is 0.1 to 25,000 g.p.m. at a 10-to-1 ratio, with frequency ranges up to 3,500 c.p.s. The flowmeter features a patented floating rotor which eliminates thrust friction and the need for thrust bearings, according to the maker. **Write or call: Pottermeter Co., Div. of Potter Aeronautical Corp., U. S. Route 22, Union, N. J. for Bulletin IB-1.**

Pumping units . . .

of the beam counterbalanced type with API-unit structure ratings of 8,900 and 11,000 lb. are presented in two new eight-page bulletins. Bulletin 477 describes the National Type E-9 pumping unit and Bulletin 478 describes the Type E-11, largest of this type of unit. Construction and operating features are illustrated in the bulletins. Consolidated specifications for beam-counterbalanced pumping units with plain cranks are also given. **Write or call: National Supply Co., 2 Gateway Center, Pittsburg, for Bulletins 477 and 478.**

Duplex slush pumps . . .

in 600 and 1,250-hp. models are reviewed in two new specification sheets —MM-600-5G and MM-1250-5G-3. The 600-hp. pump features herringbone gears 16 in. wide with low unit pressure on the gear teeth. Pinion and shaft are integrally forged from heat-treated alloy steel. The crankshaft assembly of the 1,250-hp. model is equipped with double-row, preloaded, adjustable, tapered-roller bearings. An unusual feature of the pump is its screw type of stuffing-box packing cartridge. The complete stuffing box can be screwed out for quick removal of packing. **Write or call: Ideco, One of Dresser Industries, Republic National Bank Building, P. O. Box 1331, Dallas, for Specification Sheets MM-600-5G and MM-1250-5G-3.**

continuous progress through

Creative Engineering

From the earliest beginnings of man's search for oil to the modern ways of today, creative engineering has been the mainspring behind man's untiring efforts. LEE C. MOORE, with fifty years of experience in the building of oil industry structures, has built a worldwide reputation upon creative engineering — continually reflected in the structures we build today and in those we are designing for tomorrow.

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EQUIPMENT MEN

Johnston Testers, Inc., Names Charles F. Riker . .

C. F. RIKER

as sales engineer according to an announcement by W. F. Bettis, vice president, sales. Riker came to Johnston from Brazil where he had been equipment engineer for Petrobras. Prior to his Brazilian post, Riker was with Houston Oil Field Materials Co. At one time he conducted his own business which involved contract drilling and petroleum marketing work.

Snyder to Sell, Service Major LACT Units . .

which are the result of 3 years' engineering experience in designing leases automatic custody transfer units. Snyder Co., Inc., has offices in major oil centers in Texas, Arkansas, Oklahoma, Kansas and New Mexico, according to C. W. Snyder, president. Snyder Co. has had 10 years' experience specializing in sales and service of instrumentation, measurement and control equipment.

According to Ralph W. Hill, president of Major Engineering Co., Tulsa, the various sizes of units feature a test meter which automatically checks the production meter once a day, indicates when the production meter is in error as much as 5/100 of one per cent, and shuts the unit down if the error exceeds 1/10 of one per cent.

Delta Tank, Mid-Continent Enter Sales Agreement . .

under which Mid-Continent assumes sales and service of Delta oil field equipment throughout the world with the exception of Mexico.

Announcement of exclusive sales agreement was made by Hal S. Phillips, president of Delta Tank Manufacturing Co., Inc., of Baton Rouge, La., and Ken W. Davis, president of Mid-Continent Supply Co. According to Ross B. Baze, vice president of Delta, a wholly owned subsidiary of General Gas Corp., a number of Delta's division offices in the southern and southwestern United States will be taken over by Mid-Continent and operated as new branch sales and service points. Delta personnel previously assigned to those offices either will joint the Mid-Continent organization or remain as part of the Delta staff while continuing engineering work with established Delta customers in the petroleum industry.

Products covered by the Delta-Mid-Continent agreement include Delta's full line of tanks, separators, heaters, treaters, metering vessels and other petroleum processing equipment.

RCA Is Installing More Microwave Equipment . .

for Union Oil Co. to more than double existing RCA relay systems now in service for the Los Angeles, Calif., firm. R. C. Dubois, sales manager, RCA communications products department, said the two new systems being readied will add 14 stations and 390 miles of microwave coverage to the company's present 260-mile RCA network.

One system will extend voice communications, telemetering, and supervisory control circuits to Union Oil's Oleum refinery in San Francisco and will link up with an RCA microwave system operating between Bakersfield and the company's Mulholland control center.

Glen Chance Appointed Drilco Representative . .

GLEN CHANCE

for the Ark-La-Tex district. Drilco Oil Tools, Inc., sells and services drill collars, stabilizers and torque indicators in that area.

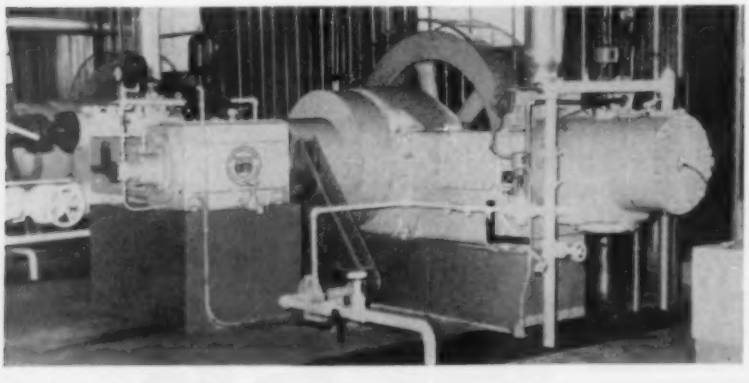
Chance was formerly with Baash Ross Tool Co., Republic Supply Co., and served 3 years as sales and service representative with Lee C. Moore Co. Representation in the Shreveport area will provide Drilco with complete coverage of the Mid-Continent from Casper, Wyo., to Lafayette, La.

Armstrong Heads Welex, Inc.'s New Division . .

covering the Panhandle-North Texas area. G. T. Armstrong has been named vice president and division manager of the newly organized division. Offices for the division are in Dallas.

The Panhandle-North Texas division includes districts in Pampa with H. S. Frazer as manager; Liberal, Kans., with Bob Colclasure as manager; Tyler and Shreveport, La., Leon Cox, manager, with his office in Tyler; and Wichita Falls and Bowie, V. A. Brockman, manager, with his office in Wichita Falls.

Other division personnel include J. E. Grady, assistant division manager, and Weldon L. Porter, division sales manager, both in Dallas. C. W. Denny is a division sales engineer in Amarillo.



18 National F-90 Triplex Pumps in Six Plants . .

are installed in a waterflooding project near Drayton Valley, Alta., Canada. The project, operated by Canadian Seaboard Oil Co., Ltd., covers 20 square miles and is expected to increase ultimate recovery to 100 million barrels, instead of 32 million barrels.

Pumping is by means of 18 National F-90 Triplex Pumps. Each pump, manufactured by The National Supply Co., is equipped with a 1⅞-in. ceramic plunger and is powered by an Ajax DP-115 engine.

The water supply is carried in cement-lined pipe to 88 injection wells. Injection rates have varied from 20 to 250 bbl. of water per well per day. Injection pressures have not exceeded 450 psi., but will be increased considerably as injection rates are raised. Lewis Engineering planned the installations.

French Contractor Visits M. J. Crose Plant . .

as a part of an extensive oil field tour in the United States. Louis Leveque, manager of the pipeline department of Ste Eau & Assainissement, headquartered in Paris, France, inspects the Crose ditch padding machine with John Manley, export sales manager of M. J. Crose Manufacturing Co., Inc., Tulsa.

Leveque's company has recently entered the petroleum pipeline construction field. It is currently laying 24-in. line in southern France and has contracted to lay 6-in. lines in the Sahara desert.

Southern Marine Forms New Insurance Subsidiary . .

to work in conjunction with insurance companies chartered and operating in Central and South American countries. The new corporation, Southern Overseas Underwriters, Inc., will handle insurance and reinsurance on offshore and onshore oil drilling and production equipment. In the beginning, operations will be confined to Venezuela, but the company will eventually operate in most of the Central and South American countries.

The officers and directors of Southern Marine & Aviation Underwriters, Inc., L. K. Griffin, president; Lee M. Stentz, vice president; Fred Kriedt, vice president, and Joseph Rivette, Jr., secretary-treasurer, are also the officers of the new subsidiary.

Catalysts & Chemicals Names J. S. Cromeans . .

J. S. CROMEANS

manager of technical service, according to R. E. Reitmeier, president.

Prior to joining Catalysts & Chemicals, Inc., Cromeans developed his knowledge in the field of catalysts in the Army Chemical Corps and at Phillips Petroleum Co. where he spent 5 years in the research and development of catalytic processes. Since leaving Phillips he held positions in catalyst research, sales and more recently as manager of technical service for the catalyst department of Girdler Co.

National Tube Names Pelster to Tulsa Post . .

as manager of sales, according to Robert E. Williams, general manager of sales. Edward H. Pelster succeeds Gerald F. Coons who is retiring.

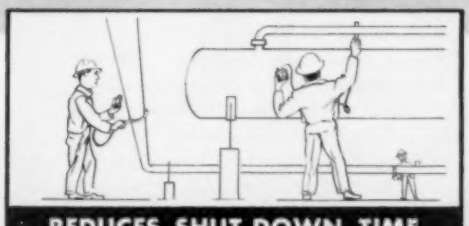
Jake Easton, Jr., who has been a salesman in the Tulsa district for

NEW Transistorized PENETRON

This highly efficient instrument answers the demand for a low-cost, light-weight tool designed to check pipe-wall thickness. The PENETRON M-4 is powered by easy-to-get dry-cell batteries, permanently calibrated for easy readings and needs little or no maintenance.

★ HIGHLY ACCURATE . . . 3% of wall thickness.
★ STABLE CIRCUIT using transistors.
★ PERMANENT CALIBRATIONS
★ DIRECT READING . . . of thickness 0 to 1 inch.
★ RESPONSE TIME: 10 sec.

Immediately Available At This NEW LOW PRICE Model 4 for 2" to 8" pipe $750.00



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Pioneers of Gamma-Ray Inspection Instruments

keep 'em turning
to the right . . .

with quality engineered

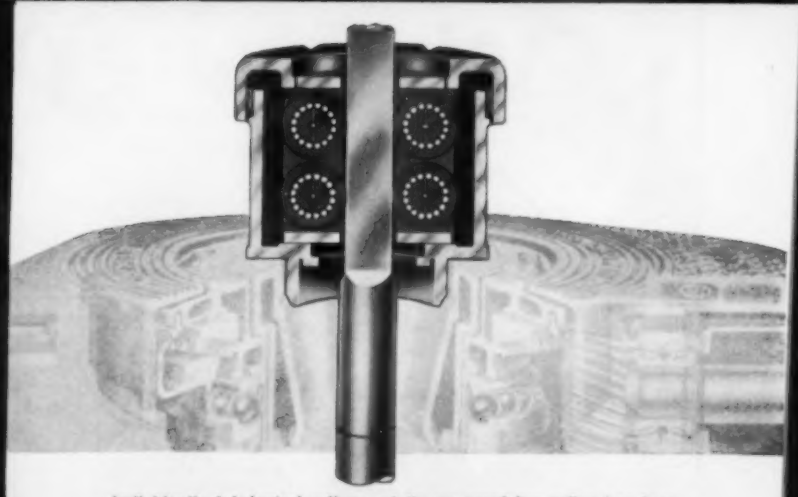
BAASH-ROSS
ROLLER KELLY DRIVE BUSHINGS

Precision engineered and ruggedly constructed, Baash-Ross roller kelly drive bushings always operate smoothly and efficiently under extremes of torque and rotary speeds.

Key feature of this bushing is the assembly of tandem rollers—in both square and hexagonal models—with eight or twelve large diameter rollers, with non-friction bearings, in constant positive contact with the kelly faces. Kelly wobble is prevented and stability is assured.

Since the rollers always provide smooth, friction-free feeding, weight indications are accurate; damaging impacts to drill string and other equipment can be avoided.

Superior performance has made Baash-Ross kelly drive bushings preferred in the industry. For additional information write to P. O. Box 1348, Houston 1, Texas, or see the Composite Catalog.



Individually lubricated rollers rotate on precision roller bearings.

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Houston, Texas; Odessa, Texas; Dallas, Texas; Long Beach, Calif.; Denver, Colo.; Oklahoma City, Okla.; Olney, Ill.; Mexico City, Mexico; Edmonton, Alberta, Canada.

FOREIGN OFFICES:

New York, N. Y.; Greenock, Scotland; London, England; Paris, France; Maracaibo, Venezuela; Buenos Aires, Argentina.

National Tube Division, United States Steel Corp., will succeed Pelster as manager of sales at Denver, Colo.

Pelster began his career with National Tube as an office boy in the St. Louis sales office. After serving as order clerk and salesman there, he was transferred to Tulsa as salesman and served customers in Tulsa and Houston until 1954, when he was made manager of sales at the Denver office.

Easton has spent his entire business career with National Tube at Tulsa and Wichita, Kan.

E. L. Williams Promoted By Herb J. Hawthorne, Inc. . .

E. L. WILLIAMS

to assistant to the sales manager in charge of field operations. He was formerly Mid-Continent field sales representative. In making the announcement, Jack W. Thigpen, sales manager, stated that William's post is a new position created by the company.

Williams has spent 20 years in geophysical field operations, previously with Petty Geophysical Engineering Co., Geophysical Service, Inc., Gulf Oil Co., and General Geophysical Co., primarily in seismic drilling. Williams joined Herb J. Hawthorne, Inc. in 1955 as a field service representative in the East Texas-Gulf Coast district. His chief responsibilities will be in expanding liason between the company's 5 areas of regional operation in the seismic industry and the company's rapidly expanding distribution points in every active area of seismic exploration.

Geophysical Service Makes Two Executive Appointments

G. J. Kohler, Jr., has been appointed vice president of Geophysical Service Inc., for geophysical operations in Latin America. Ray H. Wright has been named vice president of Geophysical Service International Corp. for Canadian operations. Kohler is assigned to GSI's headquarters in Dallas, Tex. Wright directs the firm's Canadian operations from offices in Calgary, Alberta.

In 1957, Kohler was transferred from GSI's Mexico City office to Dallas to assume duties as operations manager for Latin America. He has served as a division manager in Mexico and has worked throughout the United States, Canada, Venezuela, and Arabia. Wright has been Canadian area manager for GSI since 1956. Before transferring to Canada he was manager of GSI's southern division in Houston.

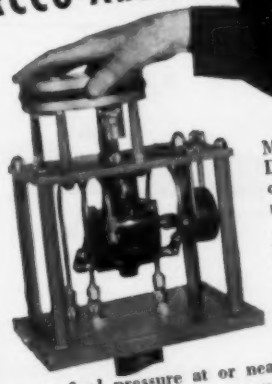
Four Wheel Drive Auto Co. Names New Truck Dealers . .

to distribute oilfield and transport trucks. G. F. DeCoursin, vice president sales, announced the appointment of Texas Industrial Equipment Co., Kyle, Tex.; Pan Am Services, Inc., Houston; Frank D. Stewart Tire Co., El Paso, Tex.; and Gilly's Motor Co., Farmington, N. M.

Texas Industrial Equipment, of which Charles Dillon is vice president and general manager, has sales operations at Austin, Waco, Corpus Christi, Pharr, San Antonio, Victoria, and El Campo, Tex. Pan Am Services, of 1700 San Jacinto St., Houston, will handle FWD trucks in Harris County, Tex. R. C. Macaulay is president. Frank D. Stewart's territory covers southern New Mexico south of and including Catron, Socorro, Lincoln, DeBaca, Roosevelt, and Currey

ARCCO

ARCCO-Anubis CONTINUOUS GAS SAMPLER



MEETING THE DEMAND for more accurate gas sampling, this newly perfected ARCCO-Anubis instrument replaces inadequate, inaccurate spot sampling methods. The Model 100-7 will over a period of seven days accumulate at a constant rate a sample of gas to a final pressure at or near 100 psig from a sample source, the minimum pressure of which is not less than 125 psig.

The ARCCO-Anubis design is based on the principle that maintenance of a constant rate of increase in gas pressure within a closed container, from zero to any selected maximum pressure, will result in a continuous rate of flow of gas into the closed container.

This is accomplished by means of a specially designed regulation system equipped with a precision drive mechanism so as to obtain a constant predetermined rate of increase in the outlet pressure into the sample container.

Send for Bulletin No. 112-RI

AVAILABLE FOR EARLY DELIVERY

AMERICAN RECORDING CHART CO.
3113 E. 11th St. Los Angeles 23, Calif.

Send for Bulletin 112-RI

INSTALLING LIQUID LEVEL GAGES

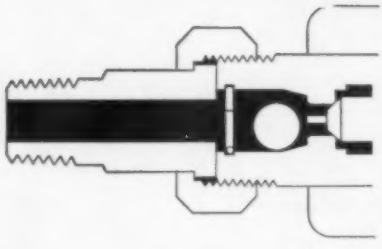
Penberthy "FLOATING SHANK"

lines up off-center holes

Center-to-center variations of vessel tappings or gage assembly can cause costly, inaccurate mounting.

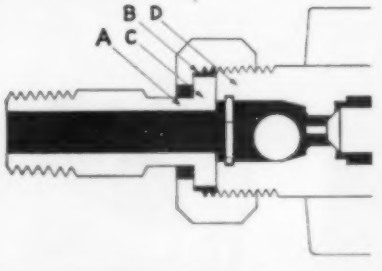
STANDARD SHANK

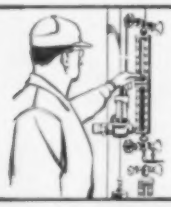
Minimum tolerance between union nut, nipple, and nipple flange prevents *any* corrective movement to compensate for inaccurate tapping. Gage and valve assemblies must either be "force-fitted" or vessel retapped.



FLOATING SHANK

Recessed neck (a) plus wide union opening (b) permit 3/16" movement of flange (c) in ANY direction. Together, "floating shanks" on top and bottom gage valves compensate for off-center tapping errors as high as 3/8". Ground flange (c) assures TIGHT metal-to-metal union with valve body (d).

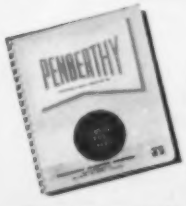




...eliminates mounting strains

By permitting freedom of movement up to 3/8" in ANY direction, Penberthy "floating shank" principle protects against mounting stresses . . . allows gage and valve assemblies to seek TRUE center-to-center position between inaccurately tapped holes.

AN EXCLUSIVE EXTRA AT NO EXTRA COST



- **cuts installation time and replacement costs by 50%**
- **provides true gage and valve alignment on incorrectly tapped vessels**
- **eliminates "force-fitting" and subsequent strains on gage and valve assemblies**
- **prevents possible damage to entire installation**
- **reduces unnecessary glass breakage due to gage distortion**

WRITE for Catalog 36 showing complete line of liquid level gages and valves, Standard or special assemblies available through local suppliers or direct.

PENBERTHY MANUFACTURING COMPANY *Division of Buffalo-Eclipse Corporation*
Dept. J **1242 Holden Avenue** **Detroit 2, Michigan**

Everywhere . . . you're seeing more
PRODUCTS BY PENBERTHY

EJECTORS
INJECTORS
CYCLING JET PUMPS
LIQUID LEVEL GAGES
GAGE VALVES
SUMP PUMPS

counties as well as El Paso County, Texas. Gilly's Motor Co., owned by Leonard Gilliland will sell in northwestern New Mexico and parts of Colorado, Utah, and Arizona.

District Sales Managers Named by J & L Supply . .

L. P. MACKEY

as the second step in the reorganization of its field sales force, according to W. L. Wolfe, vice president of sales.

L. P. Mackey, formerly local store manager at Houston, is appointed district sales manager for the South Texas district at Houston. H. H. Ray, formerly assistant district sales manager at Abilene, Tex., is appointed

H. H. RAY

G. A. WHITEKER

to the Central Texas district at Abilene. G. A. Whiteker, formerly assistant district sales manager at Odessa, Tex., has been named for the West Texas-New Mexico district at Odessa. J. W. Johnson, formerly assistant district sales manager at Wichita Falls, Tex., is appointed to the southern Rocky Mountain district

J. W. JOHNSON

G. E. BEST

at Farmington, N. M. Named to the Central Rocky Mountain district at Casper, Wyo., is G. E. Best, formerly assistant district sales manager at that location.

Mackey joined Jones & Laughlin Supply Division in 1946 and has served as storeman at Mexia, Tex., and assistant local store manager as well as store manager at Houston. Ray joined J&L as a storeman in 1936, was promoted to salesman and in 1950 became assistant district sales manager

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Eleven of Wilson Supply Company's nineteen Stores are advantageously located to give prompt service to offshore operators and drillers.

From the lower tip of Texas to Mobile—Wilson Supply Stores and men are equipped and ready to meet the needs of the offshore Rig.

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TEXAS: Alice, Corpus Christi, Victoria, San Antonio, McAllen, Bay City, Columbus, Barbers Hill, Liberty, Beaumont, Kilgore, Odessa. LOUISIANA: Lake Charles, New Iberia, Houma, Harvey, Shreveport. NEW MEXICO: Hobbs.

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DALLAS	SHREVEPORT	SAN ANTONIO
TULSA	NEW ORLEANS	LAKE CHARLES
MIDLAND	LAFAYETTE	CORPUS CHRISTI

WILSON SUPPLY CO

HOUSTON, TEXAS

of the Central Texas district. Whiteker, who joined J&L in 1945, has served as a storeman at Tulsa and Kermit, Tex.; local store manager at Best, Tex., and Casper; as a salesman at Hobbs, N. M., and in 1956 was promoted to assistant sales manager of the West Texas district at Odessa. Johnson joined the division as a storeman in 1949, serving as salesman at Odessa and Billings, Mont., and in 1957 was promoted to assistant sales manager for the North Texas district. Best, who joined J&L as a storeman in 1947, has served as local store manager at Bunkie, La., Longview, Tex., and was appointed assistant sales manager, South Rocky Mountain district at Casper.

American Cyanamid Co. Names B. R. Putnam, Jr. . .

as manager of its petrochemicals department of the organic chemicals division, according to Dr. Wm. H. Bowman, division general manager.

The department's major product is acrylonitrile which is used in making synthetic fibers, rubbers and plastics.

Putnam has been with Cyanamid since 1947 when he joined the company as a chemical engineer. He moved to the market research department in 1949 and was named manager in 1952. Since 1955 he has held the position of manager of market development for the company.

Six Vice Presidents Named By Taylor Instrument . .

L. L. FORWARD

at the board of directors' meeting following the annual meeting of stockholders. The six are L. Laurence Forward, Nathaniel B. Nichols, Marc E. Porter, William M. Walters, Karl H. Hubbard and Frank S. Ward, according to Raymond E. Olson, president.

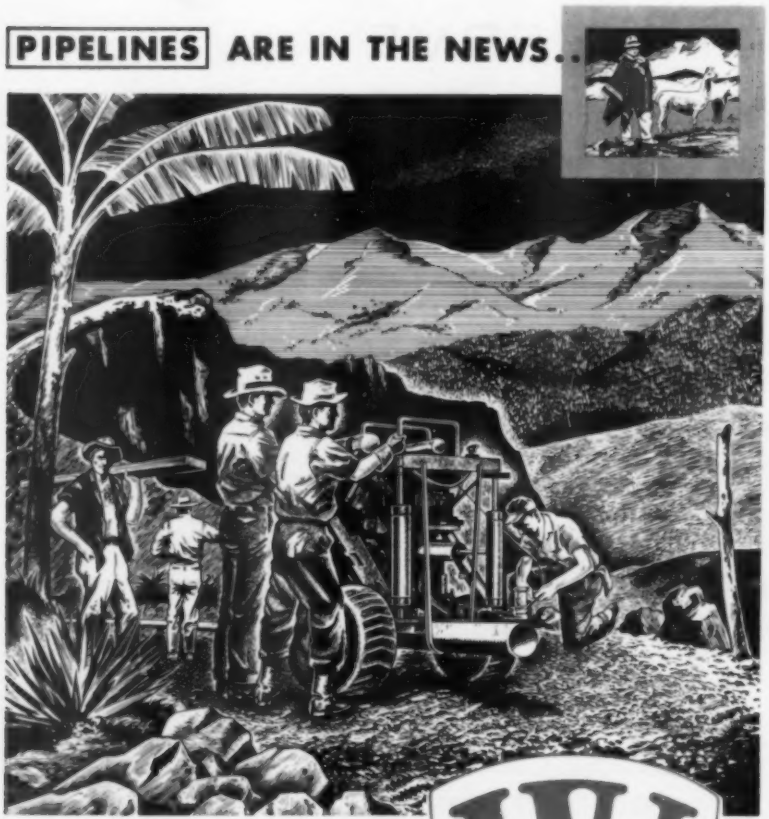
Forward is vice president and general sales manager. Nichols becomes vice president and chief engineer. Porter, a director and member of the executive committee, is also treasurer of Taylor Instrument Cos. Walters, also a director and member of the executive committee, will continue as head of all Taylor manufacturing. Hubbard becomes a vice president of research. Ward, member of the board and executive committee, becomes vice president and administrative assistant to the president.

Forward was manager of Taylor's Chicago branch until 1956. In addition to his Taylor experience, Nichols has served with the University of Minnesota and Raytheon Manufacturing Co. Porter joined Taylor in 1934 and Walters in 1936. Since joining the company in 1928 Hubbard has been successively director of research, chief engineer and technical director. He is also on the board of directors. Ward's 40 years with Taylor have been spent primarily in sales. He is a former general sales manager.

E. I. du Pont de Nemours Sells Shooting Service . .

to American Glycerin Co., Inc., Bradford, Pa. The service has until now been operated as American Glycerin section of Du Pont's explosives department.

Du Pont will continue to manufacture explosives and other devices for well-shooting, and the American Glycerin Co. will offer shooting service to the petroleum industry. Twenty-one persons have been engaged in this work, and most of them will join the new American Glycerin Co.



Watch . . . WILLIAMS BROTHERS

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OIL • GAS • WATER • PRODUCTS • PIPELINE SYSTEMS

Ralph N. Brodie Co. Names Ken K. LaPoint . .

to coordinate engineering and sales activities relative to the recently announced line of Brodie Model 500 automatic control valves.

LaPoint will headquarter at the firm's home office in San Leandro, Calif. He has had 30 years' experience in design, sales and executive posts connected with petroleum and other industrial valves.

Goulds Pumps, Inc., Makes Plowman Tulsa Manager . .

W. H. PLOWMAN

replacing J. P. Lonberger who has been named manager of the Boston branch, according to E. E. Backlund, general sales manager. Goulds Pumps, Inc., Seneca Falls., N. Y., has announced the appointment of W. H. Plowman as manager of the company's Tulsa office.

Plowman has been with the company 21 years, serving as a sales engineer in the Tulsa district for the entire time with the exception of 5 years service at the factory.

John Fabick Tractor Names New Division Manager . .

GENE CUMMINS

to serve the pipeline industry. Gene Cummins now heads the pipeline division, according to John Fabick, president. Cummins is a veteran of 20 years in the equipment business and has been with Fabick the last 12 years. Cummins will direct the sales and service activities of a staff of specialists equipped with tools and parts for servicing pipeline machinery. His division will provide counsel and information on pipeline equipment application. The division offers Caterpillar engines, tractors, pipelayers, earth-moving equipment, and leading makes of cranes, draglines, compressors and drilling equipment. Fabick Pipeline Service will also provide worldwide parts and repair service.

Cummins will headquarter at the St. Louis office of John Fabick Tractor Co.

Nocor Chemical Co. Holds 3-Day Conference . .

for field representatives in Odessa, Tex. The meeting was held to coordinate sales efforts and to acquaint representatives with some of the newest Nocors. Part of the conference was held at Odessa laboratories where various Nocor corrosion inhibitors and treating chemicals are developed.

Representatives at the conference were: J. D. Crawford, head of research; Roscoe Jarmon, sales coordinator, Jerry Mitchell, Tom Carr, Tom Inabet, Jim Haynes, Jim Scott, Jim Orchard, Sam Burnell, Henry Fischer, and John Selleck.

Charles R. Dodson Is Made Vice President, Petroleum . .

by The First National City Bank of New York. Dodson is a 1930 graduate of the University of Maryland and from Massachusetts Institute of Technology in 1932, where he received a Masters Degree of Science. He is a member of the American Petroleum Institute and is treasurer and a director of the American Institute of Mining & Metallurgical Engineers. He joined First National City Bank on March 1, 1954.

H. K. Porter Acquires Thermoid Common Stock . .

from Graham-Paige Corp. Approximately 325,000 shares have been acquired by H. K. Porter Co., Inc.

When additional information is available, Porter plans to make a proposal to other Thermoid Co. stockholders, according to T. M. Evans, chairman of the Porter company.

Davison Chemical Co. Names J. B. Hattman . .

as district representative in Tulsa. Hattman joins Davison from Houdry Process Corp. where his most recent assignment was catalyst sales engineer in the chemicals division. Prior to that he was in the research and development division engaged in various phases of catalyst and process development.

Dallas Emergency Corp. Elects H. C. Otis, Jr. . .

as chief of the volunteer group. The organization was formed to assist local law enforcement agencies, fire departments, and similar organizations in Dallas and surrounding areas by rendering first aid, rescue, and related work during local emergencies.

Otis is first vice president of Otis Engineering Corp., Dallas, Tex., oil well tool manufacturing and service firm.

Stone & Webster Makes Crocker Houston Mgr. . .

J. W. CROCKER

according to T. Cortlandt Williams, president.

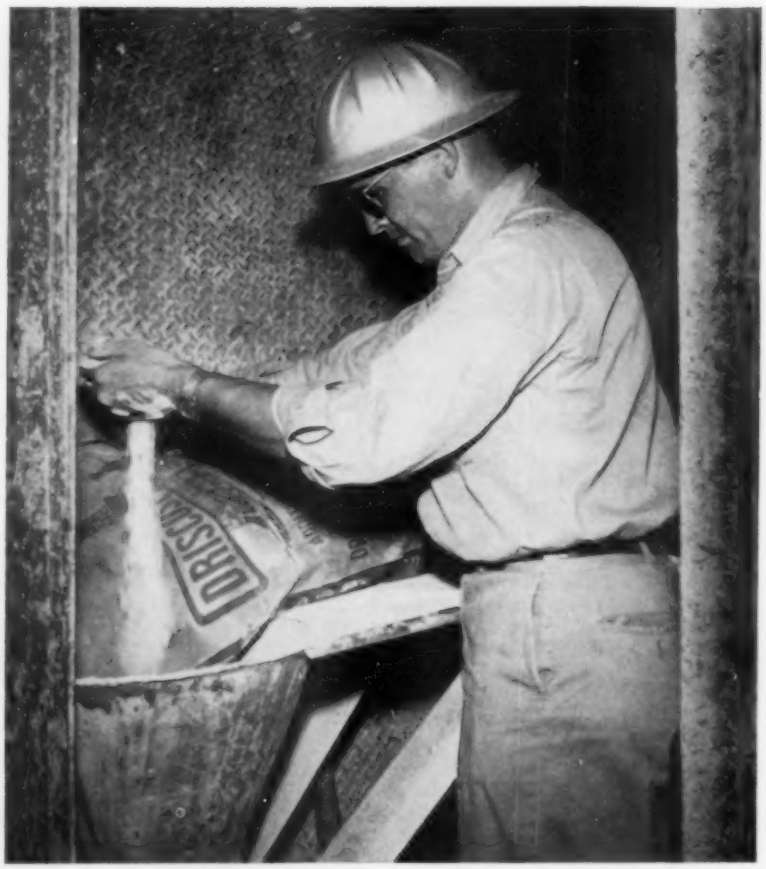
John W. Crocker is experienced in consulting work on power plants and the engineering and erection of various industrial facilities. Prior to joining Stone & Webster Engineering Corp. in Boston in 1954, Crocker was with Rice Barton Corp. in Worcester, Mass., Elliott Co., Jeannette, Pa., and Sandy Hill Iron & Brass Works in Hudson Falls, N. Y.

How you can cut drilling costs with DRISCOSE

Driscose speeds penetration. Driscose low-solids muds approach the drilling characteristics of water and at the same time provide desired viscosity and wall-building properties.

Driscose mud systems are trouble-free. Driscose muds are more stable and have better flow characteristics.

Driscose simplifies mud control, since low-solids muds require less chemical treatment than conventional systems.



A LITTLE DRISCOSE* GOES A LONG WAY!

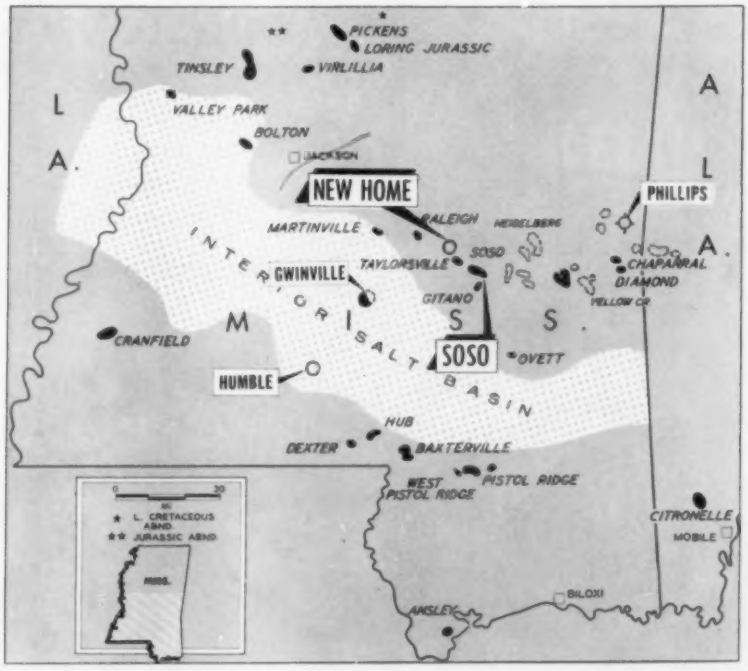
A typical low-solids mud having a viscosity of 16 cps can be made using only ¾ lb. High-Viscosity Driscose, 5 lb. per barrel bentonite and 6 to 8% oil. The use of such a Driscose system allows a reduction in solids of 19.25 lb. per barrel. Drilling Specialties Company has researched and pioneered the basic applications for Driscose since originating the use of CMC in well-drilling operations over 10 years ago.

Driscose is readily available from your regular mud dealer in three grades: High Viscosity (99+% pure CMC), Medium Viscosity (99+% pure CMC) and Technical Grade (72+% CMC). Other specific types can be furnished on request. Insist on Driscose . . . your best insurance for a trouble-free hole!

The Proof is in Performance!

DRILLING SPECIALTIES COMPANY
Bartlesville, Oklahoma

*Driscose is a trademark for Sodium Carboxymethylcellulose.



THE LOWER CRETACEOUS fields shown here have all been uncovered since 1946. Now, an apparent Jurassic strike at Soso points to a third deep phase in future exploration, and . . .

Mississippi has a DEPTH COMPLEX

BY FRANK J. GARDNER

FORTY-ONE WELLS now drilling in Mississippi carry permits to 10,000 ft. or more. To the casual reader this is not a very exciting statistic. But it is an eye opener to anyone who has consistently followed the state's oil history.

It wasn't too long ago that a 10,000-ft. hole in the state would have been a stopper. With the exception of the famous George Vasen 1 Tung Oil Co. in Stone County, few wells probed deeper than 8,000 or 9,000 ft. prior to the 1950's. The Vasen well made history when it went to 20,500 ft. in 1950 and threatened to break the world drilling record for a time.

Events in Mississippi today, however, imply that perhaps Vasen was ahead of his time. Of the 41 wells now aimed at sub-10,000-ft. depths, 18 are wildcats and 23 are field wells; 2 of the wildcats and 4 of the field wells are permitted to depths of 14,000 to 17,500 ft., and the over-all average target depth is 13,000 ft.

A new reservoir . . . Let's look at the various campaigns. The outstanding wells are flagged on the map. Of them all, by far the most significant is Gulf Oil Corp.'s 1-Z.B. Soso Field Unit-Tr. 28-7, in Section 28-10n-13w, Jasper County. This one has the deepest target depth of all, 17,500 ft., and sits on the apex of the large Soso anticline. Now drilling at 17,118 ft., it has found saturated oil sand in the Cotton Valley-Jurassic at 15,214-77 ft. If completed at this level, it will be the first Cotton Valley producer in the state.

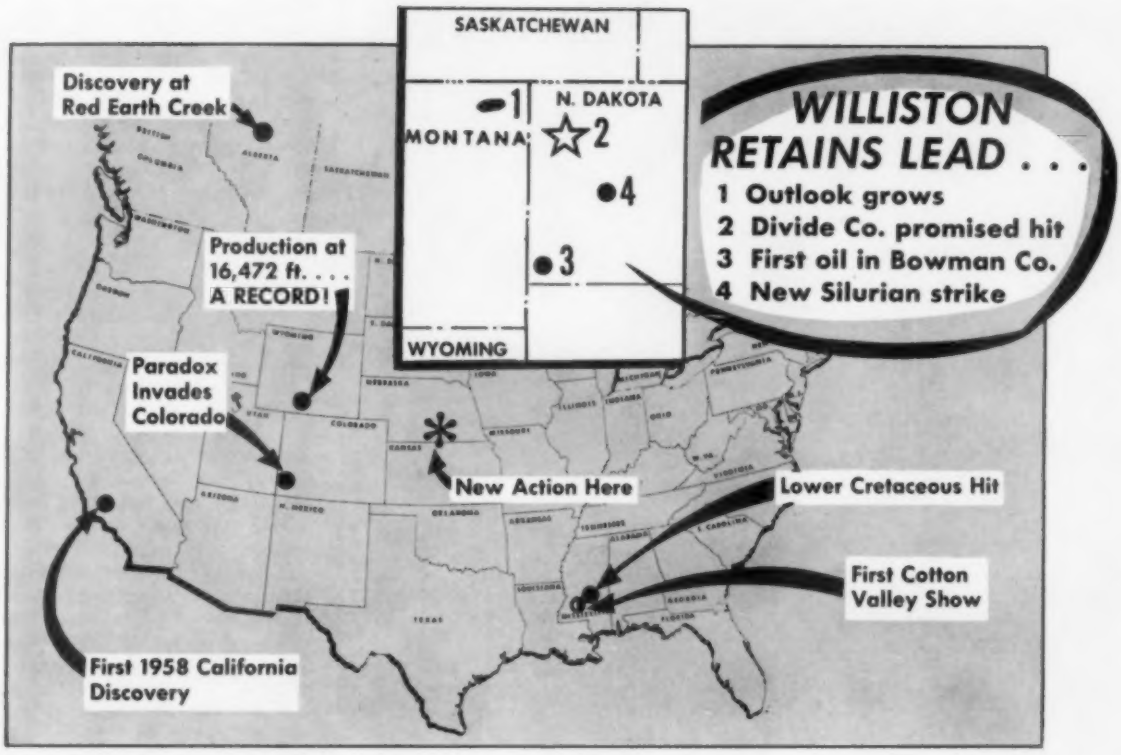
Gulf is looking for the Smackover-Jurassic in this field wildcat, and if necessary, is prepared to take it to 19,000 ft. As of now, the bit is still believed to be in Cotton Valley, which was topped at 13,765 ft. The showings in the 15,214-77-ft. interval were good enough to almost assure a discovery there. If that happens, Soso will have a sixth pay formation; present production comes from two Upper Cretaceous pools and three Lower Cretaceous pools.

And a new attack . . . Second most interesting news from Mississippi is the staking of Lone Star Producing Co. 1 Stone, a 12,300-ft. Sligo-Lower Cretaceous wildcat on the south flank of the New Home salt dome, only 4½ miles northwest of Soso field. This test, in Section 8-10n-13w, Smith County, may herald the opening of an entirely new "attack in depth" on the 43 supposedly dry salt domes in southern Mississippi. It offsets two dry holes to the west and southwest, the deepest of which stopped at 8,302 ft. It's the first tangible result of the wild salt-dome lease play that swept over Mississippi in June 1956, after oil discovery on one of East Texas' "dry" salt domes. If it should hit, we'll see an intense salt-dome drilling campaign clear across the state. New Home salt dome was first found in 1943 by Gulf's 1 Dykes but has never produced.

Moving westward, Gwinville field is the site of another deep Gulf test; the 1 Gwinville Unit No. 1 is a 14,500-ft. permit on the southwest flank of this deep-seated salt dome, in Section 34-9n-19w, Jeff Davis County. The objective here is the Lower Cretaceous section. The target depth would hardly reach the Jurassic, for an earlier test 2 miles northeast of it topped Cotton Valley at 15,550 ft. in 1955.

Farther to the southwest, Humble Oil & Refining Co. is digging ahead in a remote wildcat in Lawrence County, Section 18-5n-11e. This, the 1 Sistrunk, is supposed to go to 17,000 ft., and is fast approaching bottom. It has had little encouragement so far.

Open a new phase . . . Mississippi today, then, is in the throes of a depth complex. No well in the southern part of the state has yet reached basement, and if geologists are correct in their thinking, none will for many a day. Meanwhile, we can look for the state to enter its third phase in exploration; first there was the shallow Eocene-Upper Cretaceous play, followed by the Lower Cretaceous campaign of recent years. Now you'll be hearing more and more about the Jurassic.



Records, discoveries, action everywhere, but . . .

Williston basin stays in front

BY JOHN C. McCASLIN
District Editor

THE WILLISTON BASIN kept its firm grip on exploratory success in January. New pre-Mississippian discoveries and an indicated Ordovician strike in northern Montana and western North Dakota pushed Williston off to another big wildcat year.

Other wildcat events of note in January included a new producing-depth record for the Rocky Mountains, California's first new field of the year, additional success at Alberta's famed Red Earth Creek granite-wash field, first oil project for the Colorado side of the Paradox basin, new interest in the South-Central Nebraska basin, first important showings of oil in the Cotton Valley in South Mississippi, and new Lower Cretaceous oil at Eucutta field in Mississippi.

Williston Basin

The Williston basin is looking ahead to another banner year . . . one that will surpass 1957's tremendous success. January discoveries in Montana and North Dakota promise a real break-through in wildcatting success.

. . . **At Outlook.** The west side of Sheridan County's Outlook area in northeastern Montana added two new producers. Amerada Petroleum Corp. completed 1 Thorson as a new-field discovery, and the 1 Wexels as an extension hit. Both wells produce from the Silurian. The Thorson discovery is 2 miles west of nearest Outlook field production, while the 1 Wexels is 1 mile west of the field's west edge.

. . . **In Divide County** Kerr-McGee et al have an indicated discovery in western Divide County in the northwest corner of North Dakota. This one will boost the pre-Mississippian

Announcing . . .

New Exploration Summary Schedule

Beginning March 3, the Journal's Exploration Summary, a monthly feature, will be separated into two sections. The written resume of important exploratory events for the month of February will appear in the March 3 issue, and thereafter in the first issue of every month. The statistical material (completions, depth classifications, and footage) will appear in the last issue of March and in the last issue of each month thereafter as in the past.

Announcing IDECO AS EXCLUSIVE KELCO *Export* REPRESENTATIVE

FOR CATHEADS, POWER SLIPS and TONGS

Now Available Through Ideco's World-Wide Affiliates

Ideco and KelCo, familiar trademarks often seen together on the most advanced drilling rigs, are now linked in another appropriate way with this important announcement. Ideco's world-wide sales and service affiliates offer you an unexcelled selection of drilling and production equipment and supplies from anticline to pipeline. Contact your Ideco man today.

IDECO ONE-PACKAGE EXPORT

Through its One-Package Export Service, Ideco offers a "one source" responsibility for all petroleum equipment and supplies. Other unique advantages include a complete planning and purchasing service . . . an experienced rig-up, testing and export shipping service and a nearby deep water port equipped for handling heavy machinery.

SALES REPRESENTATIVES
Eastern Hemisphere, Dresser A. G., Western Hemisphere, Dresser International, Inc.

The safety keynote featured in all KelCo products has developed outstanding acceptability over almost two decades of world-wide operation. KelCo catheads, with exclusive anti-fouling devices, wide interchangeability of parts and choice of controls, are available for every size rig. Write today for complete details.

IDECO RECOMMENDS

AIR OPERATED POWER SLIPS — Easily serviced. Patented automatic safety latch operates with each lift of the slips. Available in sizes to accommodate 2" tubing to 7" casing. FULGRIP TUBING TONGS — Light-strong Chrome-moly steel tongs. Full contact diamond-cut dies will not score tubing. Sizes for 2⅜" to 4½" tubing.

IDECO Inc.
P. O. Box 1331 Dallas 21, Texas

KELCO *"the first modern cathead"*

The total count of the nation's January completions, by states

	TOTAL COMPLETIONS							WILDCAT WELLS							
	Total	Crude	Cond.	Gas	Dry	Service	Footage	Total	Crude	Cond.	Gas	Dry	Footage	C.T.	Act. op.
Alabama	6	3	0	0	3	0	59,144	3	0	0	0	3	24,754	1	16
Arkansas	78	52	0	3	23	0	247,920	15	4	0	1	10	59,360	0	94
California	231	159	0	5	66	1	1,075,036	39	3	0	1	35	222,988	0	221
Colorado	63	11	0	12	40	0	330,152	32	5	0	3	24	159,573	0	115
Illinois	207	83	0	1	123	0	464,718	43	2	0	0	41	96,502	30	394
Indiana	70	28	0	1	40	1	116,524	26	2	0	0	24	42,731	60	84
Kansas	410	184	1	28	186	11	1,493,657	93	14	0	4	75	379,688	17	441
Kentucky	103	38	0	16	49	0	163,843	12	1	0	1	10	17,205	89	172
Louisiana	346	153	30	21	142	0	2,736,385	46	4	2	6	34	404,434	0	464
North	125	71	0	15	39	0	474,420	22	4	0	6	12	130,896	0	179
South	177	61	24	5	87	0	1,828,670	21	0	2	0	19	242,525	0	223
Offshore	44	21	6	1	16	0	433,295	3	0	0	0	3	31,013	0	62
Michigan	30	12	0	4	13	1	90,021	10	1	0	1	8	31,126	23	108
Mississippi	48	17	2	0	29	0	410,547	26	5	0	0	21	210,652	1	44
Montana	46	16	0	3	27	0	244,991	24	1	0	2	21	121,399	5	68
Nebraska	71	14	0	0	57	0	413,860	38	5	0	0	33	218,607	0	89
New Mexico	237	132	0	61	44	0	1,081,378	36	1	0	7	28	195,520	4	211
West	118	47	0	55	16	0	492,983	17	0	0	3	14	83,694	0	97
East	119	85	0	6	28	0	588,395	19	1	0	4	14	111,826	4	114
New York	46	21	0	1	4	20	75,305	5	0	0	1	4	21,205	46	21
North Dakota	39	20	0	0	19	0	256,966	15	3	0	0	12	80,022	0	90
Ohio	80	47	0	14	18	1	201,664	3	0	0	1	2	11,668	78	193
Oklahoma	783	375	15	50	299	44	2,656,510	123	12	3	7	101	503,974	66	987
South Dakota	3	0	0	0	3	0	16,991	3	0	0	0	3	16,991	0	2
Tennessee	6	0	0	2	4	0	6,159	6	0	0	2	4	6,159	6	2
Texas	1,895	1,029	68	90	690	18	8,152,042	420	24	8	6	382	1,952,593	82	1,083
District 1	96	37	0	13	46	0	282,028	35	0	0	0	35	75,752	3	41
District 2	64	18	16	7	23	0	417,182	19	1	4	2	12	123,405	0	41
District 3	134	49	13	7	64	1	865,584	23	0	1	0	22	198,475	0	91
District 4	118	35	11	3	69	0	633,742	43	3	0	1	39	227,123	0	47
East (5 & 6)	138	60	10	1	67	0	646,801	47	1	1	0	45	227,834	0	41
District 7-B	225	100	1	5	119	0	705,246	73	5	0	2	66	246,576	24	84
West (7-C & 8)	570	433	1	4	128	4	2,718,206	96	8	0	0	88	516,190	36	494
District 9	421	228	0	27	153	13	1,255,145	71	5	0	1	65	237,233	19	132
District 10	129	69	16	23	21	0	628,108	13	1	2	0	10	100,005	0	112
Utah	41	29	0	2	10	0	236,722	9	0	0	2	7	50,318	0	131
Virginia	4	0	0	4	0	0	19,711	0	0	0	0	0	0	4	0
Washington	1	0	0	0	1	0	8,400	1	0	0	0	1	8,400	0	1
West Virginia	64	10	0	37	17	0	165,591	0	0	0	0	0	0	61	254
Wyoming	80	23	0	7	50	0	375,936	39	0	0	3	36	202,054	8	211
January 1958	4,988	2,456	116	362	1,957	97	21,100,173	1,067	87	13	48	919	5,037,923	581	5,496
December 1957	4,387	2,046	106	365	1,803	67	18,035,444	950	77	10	32	831	4,405,502	540	5,682
January 1957	5,145	2,627	40	359	2,058	61	21,421,000	1,323	156	12	48	1,107	6,456,000	716	4,900

Note: C.T.—cable tool comp., Act. op.—active operations. D.D.—25: Kans. 1, Ohio 1, Mont. 1, Ill. 4, Okla. 16, S. La. 2.

Western Canada

	TOTAL WELLS					WILDCAT WELLS				
	Total	Oil	Gas	Dry	Footage	Total	Oil	Gas	Dry	Footage
Alberta	112	67	10	35	630,349	41	5	3	33	243,040
Saskatchewan	64	47	0	17	279,383	18	4	0	14	82,840
Manitoba	12	9	0	3	26,504					
British Columbia	6	0	1	5	39,457	4	0	0	4	31,505
Western Canada	194	123	11	60	975,693	63	9	3	51	357,385

era to a new intensity in Williston if it is completed successfully.

The 1 Johnson Estate, 48 miles east of Outlook and 35 miles west of nearest North Dakota production at Noonan, had oil shows in the Red River-Ordovician. Commercial success at this remote wildcat will open up a huge chunk of oil-barren Williston lands for exploration.

... In McKenzie County. A rank Silurian discovery on the southwest flank of the Nesson anticline added further enthusiasm to the pre-Mississippian play in Williston. Amerada Petroleum Corp. 1 Shelvik, southwest of Fancy Buttes field, is an indicated Silurian strike at 12,622-70 ft. Recovery on drill-stem test was 1,755 ft. of free oil.

... In Bowman County. Carter Oil Co. opened first oil production in this southwestern North Dakota county at 1 Johnson, an Ordovician discovery on the southeast end of the long Cedar Creek anticline. The operator swabbed 195 bbl. of oil in 24 hours on test of the Red River.

It appears that Williston can't lose in 1958. Last year was its most suc-

How January field wells classified by depth

	OIL WELLS									GAS WELLS									DRY HOLES								
	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
Alabama							3																				
Arkansas	2	29	12	3		2							1	1					1	2	6	3	1				
California	14	37	38	17	24	10	9	7				1		3					5	3	3	7	8	4	1		
Colorado		1		3	1	1							1	7	1						1	7	7	1			
Illinois	10	36	33	2						1									11	35	36						
Indiana	11	11	4							1									4	10	2						
Kansas		23	96	48	3						1	13	7	3					1	13	60	32	5				
Kentucky	21	14	1	1						2	6	3	4						14	21	4						
Louisiana	7	34	18	4	23	28	27	6	2	2	2	1		3	2	2	2	1		9	13	5	9	20	38	7	7
North	7	34	12	3	10		1			2	2	1		2	2					5	11	3	5	1	2		
South			6	1	7	20	21	4	2					1		1	2	1		4	2	2	4	15	28	6	7
Offshore					6	8	5	2								1								4	8	1	
Michigan		1	8	2							2			1						1	2	2					
Mississippi					2	2	5	3															5	1	2		
Montana		2	2	2	1	8				1										3			1	2			
Nebraska					9																1	1	22				
New Mexico	1	11	25	50	32	5	6	1			11	19	13	11					1	3	4	5	1	1	1		
West		5	3	11	28						11	19	11	11						2							
East	1	6	22	39	4	5	6	1					2						1	1	4	5	1	1	1		
New York		21																									
North Dakota			1		5	10	1														2	1	1	3			
Ohio	9	2	35	1						1	4	5	3						8	4	4						
Oklahoma	54	113	79	51	39	26	1			2	13	2	6	17	3				29	46	49	27	28	12	5	1	1
Texas	86	188	303	173	185	50	16	4			9	24	9	33	4	5			24	84	52	50	65	26	7		
Dist. 1	1	18	14	2	2							8				5			1	2	6		2				
Dist. 2		1		6	6	4						1	1	3								2	4	5			
Dist. 3	2	5	7	13	13	8	1						3	3	1				3	4	6	3	9	14	3		
Dist. 4	1	4	9	5	6	7						2							1	4	4	4	13	4			
East	12	11	7	5	20	4								1					2	4	1	3	11	1			
Dist. 7-B	16	29	20	22	8						1		2						3	25	8	13	4				
West	5	34	167	86	91	23	15	4				3	1						2	8	7	15	6		2		
Dist. 9	49	84	27	31	32							1	1	24					12	36	16	10	14				
Dist. 10		2	52	3	7	4					8	9	1	2	3					1	4		2	2	2		
Utah					29																		3				
Virginia													4														
West Virginia		7	3								19	11	7						1	11	1	4					
Wyoming	3	3	7	2	5	2	1							1	2	1			5	2	2	3	2				
Total U. S.	218	533	665	359	358	144	69	21	2	10	67	79	55	80	12	8	2	1	104	247	242	147	158	70	54	8	8
Western Canada		10	7	61	27	9					1	3		3	1					1	3	4	1				
Alberta		1	6	19	27	9					1	3		2	1							1	1				
Saskatchewan			1	42																		3					
Manitoba		9																		1	2						
British Columbia														1							1						

NOTE: A = 0-1,250 ft.; B = 1,250-2,500 ft.; C = 2,500-3,750 ft.; D = 3,750-5,000 ft.; E = 5,000-7,500 ft. F = 7,500-10,000 ft.; G = 10,000-12,500 ft.; H = 12,500-15,000 ft.; I = 15,000 ft.

*See service well and condensate well breakdown on page 196.

How January wildcats classified by depth

	OIL DISCOVERIES									GAS DISCOVERIES									DRY WILDCATS								
	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
Alabama																											
Arkansas			1	1	2																	1		1	1		
California		1				1	1								1					2	7		1				
Colorado			1	1	3							1							3	5	5	3	8	6	2	3	
Illinois	2												1	2					1	2	2	4	14	1			
Indiana		2																	9	12	18	2					
Kansas			6	7	1														7	14	3						
Kentucky		1								1			1	3						3	24	40	8				
																			5	3	2						
Louisiana			2	2										2	1	2	1			1	2	4	5	5	12	4	1
North			2	2										2	1	2	1			1	2	4	4	1			
South																								4	11	3	1
Offshore																							1		1	1	
Michigan		1									1									2	3	2	1				
Mississippi				1	2		2															2	9	4	4	1	1
Montana						1				1			1							5	1	5	7	1	2		
Nebraska			1		4															1		2	30				
New Mexico				1						1	2		1	1		2				6	4	5	8	1	1	2	1
West										1	1			1							2	3	8	1			
East				1							1		1		1		2			6	2	2			1	2	1
New York													1									4					
North Dakota						3							1								3	7	2				
Ohio													1									2					
Oklahoma			4	4	2	2					1	1	1	4					21	14	23	16	18	8			1
South Dakota										1	1											1	2				
Tennessee																			3	1							
Texas		1	4	5	9	3	2			1	2	1	1	1					29	81	58	74	92	30	12	5	1
Dist. 1					1														14	9	6	3	2	1			
Dist. 2												1	1									3	6	2	1		
Dist. 3																							8	9	3	1	1
Dist. 4				1	1	1								1					3	6	4	4	16	4	2		
East						1													2	6	4	10	18	4	1		
Dist. 7-B		1	2	1	1					1	1								2	22	18	9	15				
West			2	3	1	1	1												3	12	10	34	17	4	4	4	
Dist. 9					5						1								5	26	14	10	9	1			
Dist. 10							1														2	1	1	5	1		
Utah														2						1	1		4	1			
Washington																								1			
Wyoming												1	1					1	2	6	3	9	10	4	2		
Total U. S.	2	6	19	22	23	10	5			5	7	4	9	15	2	4	1	1	80	159	159	183	219	63	36	15	5
Western Canada			1	3	4		1					1			2					2	16	10	10	8	5		
Alberta			1	1	3							1			2					2	11	3	6	7	4		
Saskatchewan				2	1		1														5	6	3				
Manitoba																						1	1	1	1		
British Columbia																											

NOTE: A = 0-1,250 ft.; B = 1,250-2,500 ft.; C = 2,500-3,750 ft.; D = 3,750-5,000 ft.; E = 5,000-7,500 ft. F = 7,500-10,000 ft.; G = 10,000-12,500 ft.; H = 12,500-15,000 ft.; I = 15,000 ft.

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How January field and wildcat drilling compared in footage

	FIELD WELLS					WILDCAT WELLS			
	Oil	Cond.	Gas	Dry	Service	Oil	Cond.	Gas	Dry
Alabama	34,390								24,754
Arkansas	133,340		10,285	44,935		19,233		7,525	32,602
California	681,579		22,467	145,413	2,589	23,631		3,000	196,357
Colorado	30,290		53,468	86,821		24,393		15,946	119,234
Illinois	178,938		359	188,919		1,100			95,392
Indiana	42,208		898	29,441	1,246	3,159			39,572
Kansas	587,790	4,860	91,592	397,152	32,575	55,776		21,728	302,184
Kentucky	47,384		37,197	62,057		1,691		740	14,774
Louisiana	947,659	327,531	107,761	949,000		15,167	27,870	57,212	304,185
North	188,297		39,272	115,955		15,167		57,212	58,517
South	569,877	264,805	57,729	693,734			27,870		214,655
Offshore	189,485	62,726	10,760	139,311					31,013
Michigan	33,201		8,540	15,154	2,000	1,667		2,135	27,324
Mississippi	126,554	15,503		57,838		39,044			171,608
Montana	94,799			28,793		9,727		5,194	106,478
Nebraska	55,268			139,985		28,349			190,258
New Mexico	618,968		200,034	66,856		4,998		36,512	154,010
West	213,595		192,329	3,365				8,705	74,989
East	405,373		7,705	63,491		4,998		27,807	79,021
New York	27,050				27,050			4,000	17,205
North Dakota	132,686			44,258		27,944			52,078
Ohio	125,649		35,837	26,398	2,112			3,828	7,840
Oklahoma	1,167,072	90,174	191,364	648,143	55,783	59,941	34,993	35,695	373,345
South Dakota									16,991
Tennessee								1,705	4,454
Texas	3,988,977	489,370	421,999	1,251,957	47,146	134,105	68,254	17,894	1,732,340
Dist. 1	96,082		79,635	30,559					75,752
Dist. 2	99,031	91,520	26,850	76,376		6,007	34,619	7,608	75,171
Dist. 3	255,387	113,546	39,238	250,637	8,301		10,017		188,458
Dist. 4	159,131	90,045	5,456	151,987		18,491		6,160	202,472
East	243,256	70,073	6,480	99,158		7,551	5,431		214,852
Dist. 7-B	280,945	2,000	10,338	165,387		17,927		2,510	226,139
West	2,005,314	1,746	14,695	167,315	12,946	44,502			471,688
Dist. 9	594,994		152,553	244,466	25,899	29,494		1,616	206,123
Dist. 10	254,837	120,440	86,754	66,072		10,133	18,187		71,685
Utah	168,815			17,589				11,779	38,539
Washington									8,400
Virginia			19,711						
West Virginia	21,613		100,337	43,641					
Wyoming	100,501		34,075	39,306				24,241	177,813
Total United States	9,344,731	927,438	1,335,924	4,283,656	170,501	449,935	131,117	249,134	4,207,737
Western Canada	547,374		37,022	33,912		50,665		18,928	287,792
Alberta	344,965		31,992	10,352		26,919		18,928	197,193
Saskatchewan	183,122			13,421		23,746			59,094
Manitoba	19,287			7,217					
British Columbia			5,030	2,922					31,505

cessful exploratory year since Beaver Lodge, and discoveries near the end of 1957 and in the first few weeks of this year herald an even better year ahead.

Other Newsmakers

New depth record . . . Pure Oil Co.'s 1 Badwater Unit in Natrona County, Wyoming, tapped the deepest production in that state and in the entire Rocky Mountain province. Official completion was 5,500 M.c.f. of gas per day from perforations in Upper Cretaceous rocks between 15,216 and 16,472 ft.

Oxnard Plains . . . The Oxnard area in Ventura County provided California with its first new-field discovery of 1958.

The find was scored by Standard Oil Co. of California, Western Operations, Inc., at 1 Borchard, 2½ miles northwest of Oxnard field and 2½ miles northeast of West Montalvo field. The well flowed at the daily rate or 531 bbl. from perforations in the Oligocene-Sespe sand. El Rio is the name of the new field.

Red Earth Creek . . . Union Oil Co. of California struck oil at another test in this northern Alberta region, 6 miles northeast of closest field production at Red Earth Creek. Production is from the granite wash.

Paradox basin . . . A Montezuma County wildcat may open first commercial oil production on the Colorado side of the basin. Big Horn Powder River Corp. and Hathaway Co. recovered 1,540 ft. of clean oil on drill-stem test at the 1 Government. The indicated discovery is located just east of the Hatch Unit, northernmost Pennsylvanian producer on the Utah side of the basin.

Nebraska . . . Harlan County in South-Central Nebraska now has three oil pools as a result of W. E. Wickizer's success at 1 Bottin, 3 miles north of the town of Alma. The well was completed on pump for 35 bbl. of oil per day from Kansas City-

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SERVICE-WELL DEPTH BREAKDOWN—JANUARY 1958*

	A	B	C	D	E	F
California	....	....	1	....	....	....
Indiana	1	....	....	....	....	....
Kansas	2	1	6	1	1	....
Michigan	....	1	....	....	....	....
New York	....	20	....	....	....	....
Ohio	....	1	....	....	....	....
Oklahoma	33	8	3	....	....	....
Texas	7	6	1	2	1	1
Dist. 3	....	....	....	....	....	1
West	....	2	1	....	1	....
Dist. 9	7	4	....	2	....	....
Total	43	37	11	3	2	1

*Only areas with service wells are listed.
A = 0-1,250 ft.; B = 1,250-2,500 ft.; C = 2,500-3,750 ft.; D = 3,750-5,000 ft.; E = 5,000-7,500 ft.; F = 7,500-10,000 ft. (No service wells deeper than Class F in January).

FIELD CONDENSATE-WELL DEPTH BREAKDOWN—JANUARY 1958*

	A	B	C	D	E	F	G	H	I
Kansas	....	....	....	1	....	....	....	....	....
Louisiana	....	....	....	....	1	5	11	10	1
South	....	....	....	....	1	2	9	9	1
Offshore	....	....	....	....	....	3	2	1	....
Mississippi	....	....	....	1	....	....	1	....	....
Oklahoma	....	....	1	1	5	4	....	....	1
Texas	....	2	....	2	13	29	13	1	....
Dist. 2	....	....	....	1	5	4	2	....	....
Dist. 3	....	....	....	....	1	5	6	....	....
Dist. 4	....	....	....	....	4	5	2	....	....
East	....	....	....	1	3	4	....	1	....
Dist. 7-B	....	1	....	....	....	....	....	....	....
West	....	1	....	....	....	....	....	....	....
Dist. 10	....	....	....	....	....	11	3	....	....
Total United States	....	2	1	5	19	38	25	11	2

*Only areas with condensate wells are listed.
A = 0-1,250 ft.; B = 1,250-2,500 ft.; C = 2,500-3,750 ft.; D = 3,750-5,000 ft.; E = 5,000-7,500 ft.; F = 7,500-10,000 ft.; G = 10,000-12,500 ft.; H = 12,500-15,000 ft.; I = 15,000 ft.

WILDCAT CONDENSATE-WELL DEPTH BREAKDOWN—JANUARY 1958*

	A	B	C	D	E	F	G	H	I
Louisiana	....	....	....	....	....	....	....	2	....
South	....	....	....	....	....	....	....	2	....
Oklahoma	....	....	....	....	....	2	....	....	1
Texas	....	....	....	....	2	5	1	....	....
Dist. 2	....	....	....	....	1	3	....	....	....
Dist. 3	....	....	....	....	....	....	1	....	....
East	....	....	....	....	1	....	....	....	....
Dist. 10	....	....	....	....	....	2	....	....	....
Total United States	....	....	....	....	2	7	1	2	1

*Only areas with condensate wells are listed.
A = 0-1,250 ft.; B = 1,250-2,500 ft.; C = 2,500-3,750 ft.; D = 3,750-5,000 ft.; E = 5,000-7,500 ft.; F = 7,500-10,000 ft.; G = 10,000-12,500 ft.; H = 12,500-15,000 ft.; I = 15,000 ft.

Pennsylvanian lime. The three oil pools in Harlan County are the only production in one of the country's biggest unexplored areas—the South-Central Nebraska area.

South Mississippi . . . Hopes for Jurassic - Cotton Valley production in southern Mississippi were enlivened by good oil shows at a Gulf Oil Corp. wildcat in Soso field. Gulf's shows are the first definite oil findings ever reported in the Cotton Valley in Mississippi.

. . . Eucutta. This Wayne County field gained its second Lower Cretaceous discovery in 2 months at Gulf Oil Corp. 1 Eucutta Unit. The well flowed oil from the Rodessa. The first Lower Cretaceous discovery in the field was in the Paluxy sand. All previous production in the field, opened in 1943, had been from Upper Cretaceous-Eutaw sands.

Awards Announced For Outstanding Papers

Recipients of the awards for the best paper in the Journal of Paleontology and the Journal of Sedimentary Petrology for 1956 have been announced by R. V. Hollingsworth, president of the Society of Economic Paleontologists and Mineralogists.

Mrs. Christina Lochman-Balk, professor of geology at the New Mexico Institute of Mining & Technology, Socorro, will receive the award for her paper entitled, "The Evolution of Some Upper Cambrian and Lower Ordovician Trilobite Families," published in the Society's bi-monthly Journal of Paleontology, Vol. 30, No. 3 (May 1956).

Maurice A. Carrigy, now with the National Research Council of Alberta, Edmonton, will receive the award for his paper entitled, "Organic Sedimentation in Warnbro Sound, Western Australia," published in the Society's quarterly publication, the Journal of Sedimentary Petrology, Vol. 26, No. 3 (September 1956).

These best-paper awards are the fourth to be presented by the SEPM. Certificates are given to the authors whose papers appearing in the journals during the second preceding year are judged by the Research committee to be the most outstanding contributions of that year.

Pennsylvania gets deep gas find

CONTINUING its search for new sources of gas supply in western Pennsylvania, Peoples Natural Gas Co. has collaborated with Snee & Eberly, independent oil and gas operators, in making a major new gas-pool discovery in Jenner Township, Somerset County.

A wildcat deep-test well drilled on the property of C. E. Williams had an initial open flow of 900 M.c.f., with a more significant rock pressure of 3,660 lb. during a 48-hour period.

The well is located on the east flank of the Johnstown dome structure. It was drilled to a depth of 8,152 ft. into the Onondaga chert.

Significance of the successful wildcat drilling venture is that a new gas pool, the first pool on the east flank of the extensive Laurel Ridge anticline in Pennsylvania, has been opened.

Fracturing of the well may increase production to approximately 8 M.M.c.f., the firm hopes.

One other producer, 2 Beck well, completed on the west flank of the Johnstown anticline, was drilled by Snee & Eberly and Peoples Gas last year. The well came in during May 1957.

The reservoir pressure of the Williams well is high.

New test revives old Michigan pool

A STORY-BOOK oil play for Michigan appears in the making.

Twenty-two years after the discovery well was drilled in Crystal Valley, Oceana County, a new test in semi-wildcat territory is producing at estimated rate of 130 bbl. day causing two offset starts and two other tentative outside locations.

Robert L. Bond 2 Cloud NW NW SE 16-16n-16w, logged Dundee lime at 2,333 ft., 445 M.c.f. of gas at 2,338 ft., and oil pay from 2,338-43 ft., present total depth. Well flowed 86 bbl. first 24 hours and 74 bbl. second day. Acidized with 500 gal., it flowed 130 bbl. on 24/64-in choke with 330 lb. on casing and 110 lb. on tubing.

Crystal Valley field originally was discovered in 1946 by Charles W. Teater, now living in California, with wildcat in SE NE NW 16-16n-16w, ¼ mile north of Bond well. However, Teater completed discovery at 1,866 ft. in Traverse lime zone. Six Traverse wells were drilled in old plan, all of which have been abandoned.

Last year George Swan and associates drilled new outpost producer on Skidmore 1, SW NE NE 15-16n-16w, 1½ miles east of original play. Skidmore since has been offset east with a 20-bbl. oil well in Dundee at 2,527 ft.

Potentially, Bond well could lead to area's biggest and best development.

Fourth well set for Wyoming field

THE ALMY-MESAVERDE is slated for testing at the fourth well in the Birch Creek Unit of Sublette County, Green River basin, Wyoming. The California Co. made location for 4 Birch Creek Unit in C NE NE 23-27n-113w.

The new well will test the Almy and Mesaverde sands at about 2,550 ft. Location is 1 mile southeast of the discovery well in this unit, completed last year for 1,400 M.c.f. of gas per day from Bear River perforations at 7,543-80 ft. The No. 4 well is also ½ mile southeast of the 2 Unit which flowed 1,680 M.c.f. of gas daily from the Bear River. Another well on the unit was successful and is now shut in. All three wells completed thus far have been Bear River producers at 7,500 ft. The shallower Almy and Mesaverde sands were tested in both the field discovery, and its confirmation, but no production was obtained from these zones.

Dry Piney . . . Mountain Fuel Supply Co. 3 Dry Piney Unit, confirmation discovery to the Dry Piney Unit discovery in Sublette County, flowed 3,850 M.c.f. of gas per day from Frontier sand perforations at 7,641-67, 7,679-96, and 7,701-08 ft.

Location of the successful confirmation is 3 miles north of the discovery well. That well, a 1957 discovery, made 7,400 M.c.f. per day from the Frontier sand. The No. 2 well was dry.

Montana's Outlook field moves south

OUTLOOK FIELD in Sheridan County, northeastern Montana, added another producer last week. The new well is Amerada Petroleum Corp. 1 State-F, SW NE NE 2-35n-52e, a south extension to the field.

The well was completed for 91 bbl. of oil per day from Outlook-Silurian pay at 9,060-94 ft. on 16/64-in. choke. Location is 3½ miles east of Redstone, Mont.

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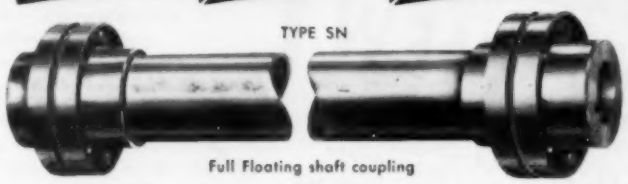

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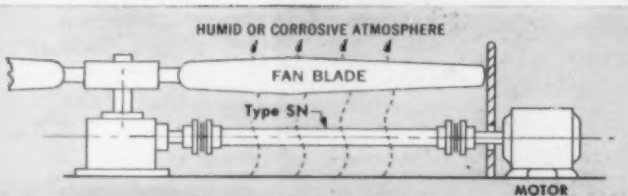

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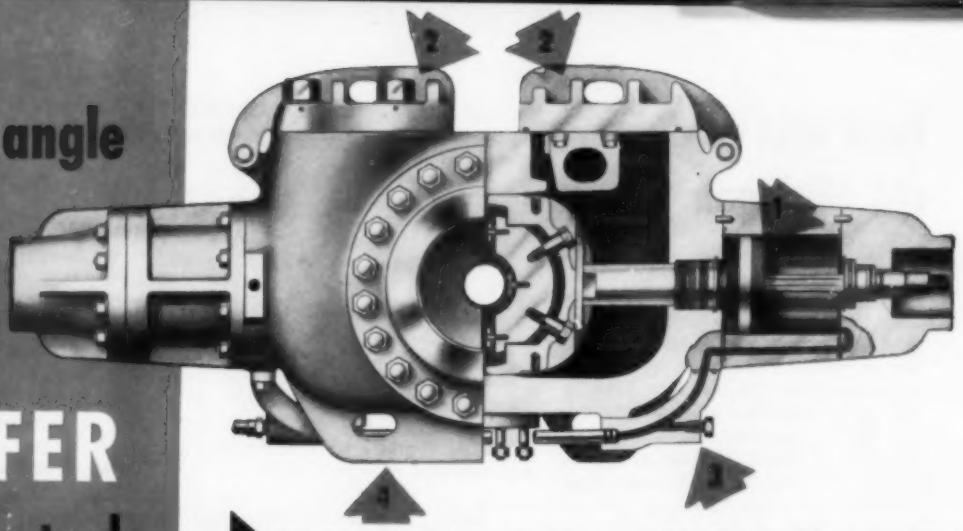
Another angle on SHAFFER Cellar Control Gate Features



TOP VIEW *emphasizes* BASIC DESIGN ADVANTAGES

1 Note the *Single* hydraulic piston by which each ram is actuated. Not only is this piston *directly behind* the ram for maximum operating efficiency, but one-piston-per-ram means:

a. Fewer and simpler operating parts.
b. Fewer hydraulic seals to maintain.
c. Simpler manifolding of hydraulic lines.
d. Easier servicing when necessary.
e. More-favorable ratio of piston area to piston circumferential seal — therefore less internal friction plus increased efficiency.

2 Note how the patented doors through which the rams are serviced open along the *side* of the gate where there is plenty of room.

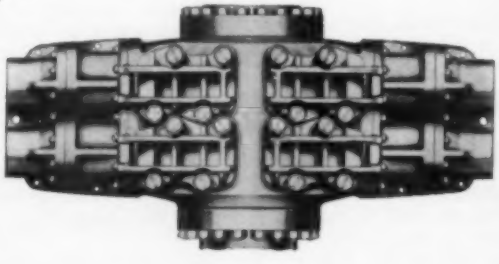
There is no need to expand critical *end* dimensions of the gate for servicing the rams — nor is it necessary to allow extra space above the gate. Since end and height dimensions are the most critical ones in governing cellar requirements, Shaffer's basic advantages here are of paramount importance!

3 Note how all manifold connections are compactly unitized on one side of the gate. Connections are quick and easy to make — equally easy to service.

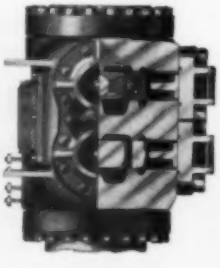
4 Note the sturdy integral ribs upon which the gate "slides" for easy loading, unloading and storage. This feature also protects against damage to studs, lines and other parts.

You have probably seen the Shaffer Hydraulic Cellar Control Gate from the side view many times before. But to get a better idea of the really important advantages found in Shaffer Hydraulic Gates, take a close look at this *top* view...

FRONT VIEW



END VIEW



No matter how you look at Shaffer Gates — from the front, top or ends — you'll find them unsurpassed in basic engineering advancements. Let your nearest Shaffer representative give you the complete story. Or write direct!

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In far Southwest Texas . . .

Shallow vs. Deep

A SHALLOW-SAND oil discovery in Texas' far-southwestern Val Verde County not only gives this relatively little explored region of the state something more to think about but provides a significant contrast to the much deeper objectives to which most of the county's limited and scattered drilling has been directed.

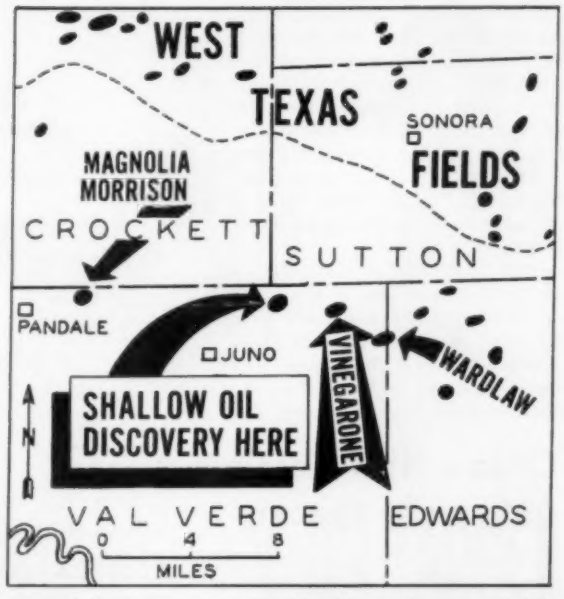
The new discovery is in a 400-ft. well drilled by H. R. Rehders, Jr., as a remote wildcat location about 12 miles northeast of Juno in the northeastern part of the county, less than 2 miles south of the Sutton county line. Its location is on Rehders' Drisdale lease, in Section 1, GWT&P Survey, Block G.

Total depth of the discovery well is only 419 ft. Bottom of the hole is plugged back to 395 ft., from which depth the well has been completed on the pump making 20.48 bbl. of clean 20.7°-gravity oil per day on its potential gage. Its producing zone is in Paluxy (Lower Cretaceous) sand, top of which was logged at 283 ft.

Although the well is small and probably does not open a sizable reserve, its location, in the almost virgin Val Verde basin, is significant. Nearest production (gas), in Pennsylvanian-Strawn sand below 10,000 ft., is at Vinegarone, 9 miles east.

Only other production discovered in this county has been in a lone deep gas well (Magnolia Petroleum Co. 1 Morrison on map) 30 miles west, in the northwestern part of the county, and the currently inactive Wardlaw field, about 20 miles southeast on the Edwards county line.

Magnolia's well, drilled in 1956, is productive of gas from the Ellenburger below 13,900 ft. Wardlaw, discovered in 1947, has produced, spasmodically, from shallow (300-400 ft.), Lower Cretaceous-Glen Rose sands. Its wells have been small pumpers, making 18°-gravity oil.



VAL VERDE basin, near-virgin wildcat territory in far Southwest Texas, added a new oil pool with production from the Paluxy-Lower Cretaceous.

PANHANDLE

Hansford County Gets Pennsylvanian Oil Pool

Hansford County in the Texas Panhandle has another Pennsylvanian oil pool as a result of J. M. Huber Corp. and Cabot Carbon Co.'s successful wildcat, the 1 Nusbaum in the southeast part of the county.

The well pumped 25 bbl. of oil and 54 bbl. of salt water daily from Oswego perforations at 6,455-6,503 ft. The well also produces from the Hepler zone at 6,614-68 ft.

Dual Gas Production In Ochiltree County

Dual gas production was established at Horizon Oil & Gas Co.'s 1 A. B. Hoghland in northwestern Ochiltree County, Texas Panhandle. The well is both an upper and lower Morrow-Pennsylvanian producer.

From upper Morrow perforations at 6,822-36 ft. the well flowed 5,800 M.c.f. per day; from lower Morrow it made 4,300 M.c.f. per day at 7,268-78 ft. Location of this new pool is 12 miles northwest of Farnsworth.

Louisiana pool jumps river

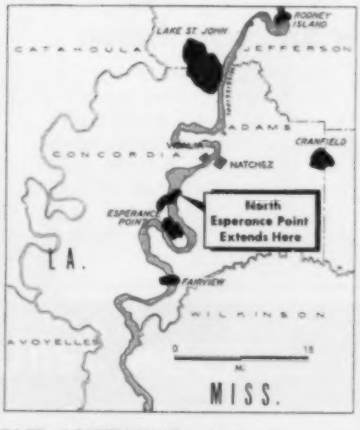
RECENT EXTENSION of production in the Esperance Point area of Concordia Parish, Louisiana, across the Mississippi River, into Adams County, Mississippi, making the third dual-state field on the Louisiana side. Mississippi has one other dual-state field, which it shares with Alabama.

The Esperance Point extension, designated as North Esperance Point field, was by Magnolia Petroleum Co. at its 2 Armstrong Estate, completed as 105-bbl. Wilcox oil well flowing through ¼-in. choke. Pay is perforated at 7,114-28 ft. in the same zone productive on the Louisiana side of the river.

The well was drilled directionally from surface location on the Mississippi bank of the river to bottom location under the river about 1,400 ft. northeast of the nearest producer (Magnolia's 2 Junkin-State) on the Louisiana side. Location is about 15 miles down the river from Natchez.

Magnolia already has location for two additional wells to be drilled on the Mississippi side of the field.

Other fields shared by Louisiana and Mississippi are Rodney Island and Fairview. The former, productive from 9,200 ft. Tuscaloosa sands, discovered in 1953 on Louisiana's Tensas Parish side of the river where there are about 20 producing wells, was extended in 1956 into Mississippi's Jeferson County, where there now are four wells.



EAST LOUISIANA'S North Esperance Point Wilcox field moved across the Mississippi River into Mississippi.

Fairview, down the river from Esperance Point, was discovered in 1950 in Concordia Parish with production from Wilcox sands at 6,600-6,700 ft. It was extended into Adams County, Mississippi, in 1956. It has five wells in Louisiana, and nine in Mississippi.

The Esperance Point area is one of the larger Wilcox fields. More than 50 wells have been completed on the Louisiana side.

Mississippi's other dual-state field, on the Alabama line, is at Langsdale, productive from Eutaw sands at 3,500 to 3,800 ft. Discovered in 1945, in Clarke County, Mississippi, it now has nearly 40 wells. Alabama's extension is in Choctaw County.

Ohio's New Castle gets wide spacing

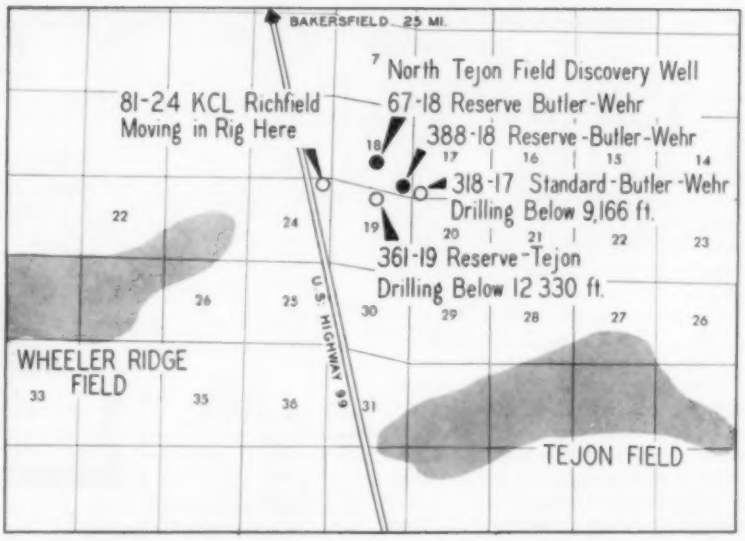
SEVERAL EXTENSIONS to New Castle field have been developed and probably the best in Walhonding pool located in the northwest corner of New Castle Township, Coshocton County.

The latest completion, the R. B. Weed et al 1 M. W. C. District-Ogle, Lot 3, is reported as making 200 bbl. in a 24-hour test after fracturing Clinton sand at 2,890-2,937 ft. Wells in this area are widely spaced to insure adequate reserves as close spacing in the town of Walhonding has proved unprofitable.

Permian gas tapped in Southwest Kansas

Southwestern Kansas' Grant County has a new Permian gas pool. The discovery of new Council Grove production is Hugoton Production Co.'s 1-33 Hindmarsh, 3 miles north of Zionville in C NE NE 33-29-27.

The well flowed 2,430 M.c.f. of gas per day from perforations at 2,820-64 ft.



CALIFORNIA development interest centers in the North Tejon field of Kern County. Vedder sand success is mounting steadily in this San Joaquin Valley area.

Vedder scores a third well

THE ELUSIVE but highly prolific Vedder production in the year-old North Tejon field, Kern County, gives promise of yielding a third good well in Reserve Oil & Gas Co. 361-19 Reserve-Tejon after an excellent test of the Z-4 zone.

Reserve's latest try, a joint venture with Standard Oil Co. of California, is located less than ½ mile south of the discovery well and about ½ mile southwest of the field's only other producer.

During a formation test of the Z-4 zone recently, Reserve 361-19 flowed 32.1°-31.6° gravity crude at a 1,500-2,000 bbl. daily rate. The test was run with 3,238 ft. of mud cushion which surfaced in 26 minutes. The oil surfaced in 1 hour and 5 minutes. The interval tested is at 12,015-12,174 ft.

Reserve had some anxious moments when the Z-1, Z-2, and Z-3 zones proved too tight to be productive. After the Z-4 test, Reserve drilled ahead and ran a test on the Z-5 stringer at 12,189-12,302 ft. but failed to get a fluid rise after the test was open almost an hour and a half. Reserve was drilling ahead below 12,330 ft. after the unsuccessful Z-5 test.

The Z-4 productive zone has been tentatively labeled a new Vedder Zone pool discovery. The field discovery, 67-18 Reserve, was completed in 222 ft. of Vedder zone between 11,850 ft. and 12,207 ft. The first extension, 388-18 Reserve-Butler-Wehr, completed last November, was perforated in a zone at 11,589-11,979 ft.

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SHORT
LOK-ON
FIG. 904

SHORT
SLIP-ON
FIG. 902

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LONG
LOK-ON
FIG. 905

LONG
SLIP-ON
FIG. 903

The double-bow design of the Long Larkin Centralizer, in both the Slip-On and Lok-On Types, gives you the maximum in centralizer performance.

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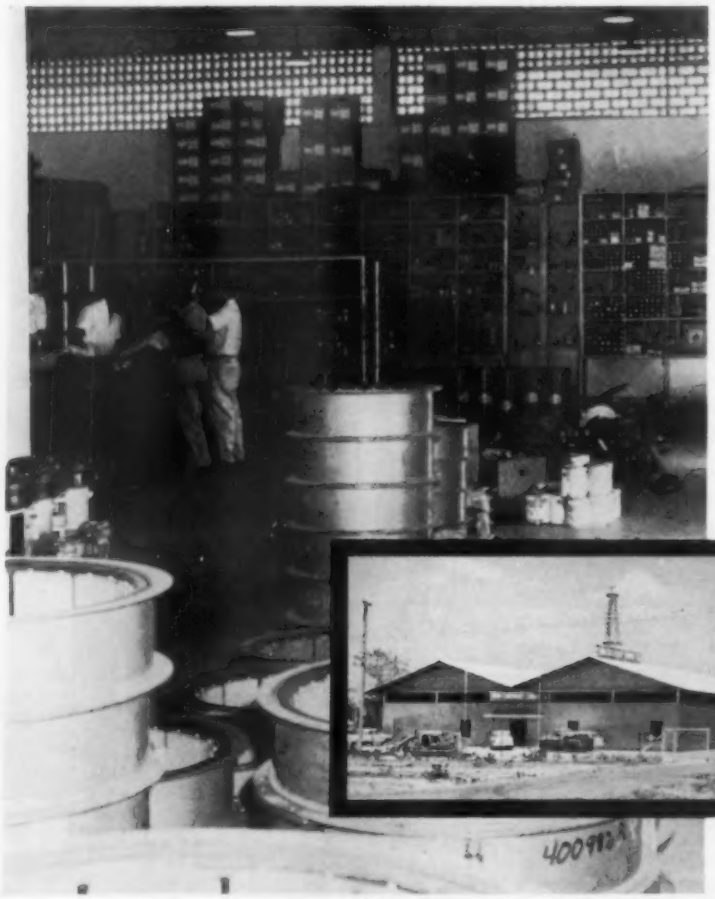

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Reserve was drilling below 9,166 ft. on 318-17 Standard-Butler-Wehr, located about ¼ mile southeast of the discovery well.

In another late development in the North Tejon field play, Richfield Oil Corp. was moving in a rig to drill for Vedder production on a site about 1 mile due west of Reserve's discovery well and 361-19 Reserve-Standard-Tejon.

Denver basin hits new stride

THE CONFIRMATION WELL to new West Bijou field in Morgan County, Colorado, flowed oil at the hourly rate of 42 bbl. from Dakota "D" sand. The well is Williamson-Kissinger 1 Conine, C SE SW 1-4n-60w. Flow was through ¾ in. choke from perforations at 6,201-04 and 6,194-99 ft.

This confirmation well to the field discovery which flowed 930 bbl. of oil per day is further proof of the new field's potential. Several operators are busy with offsets and offset plans in the field. Gulf Oil Corp. 1 Price, an east offset to the field discovery, is testing in the "D" sand; Williamson-Kissinger has another successful prospect at 1-A Bender in C NE NE 14-4n-60w. British-American Oil Producing Co. is also active in this new Denver basin field. There are a half dozen wells either going or planned in this area.

The south offset well to West Bijou field in Morgan County, Colorado, flowed oil at the daily rate of 305 bbl. from "D" Dakota sand perforations at 6,177-78 ft. This new addition to the Denver basin's hottest new area, is the south offset to Williamson-Kissinger 1 Matthews, field discovery well. It is the 1 Bender in C NE SW 12-4n-60w.

Other offsets are drilling in the field: Williamson - Kissinger 1-A Chester Bender, C NE NE 14-4n-60w, Gulf 1 McDonald, SW SE 1-4n-60w, and Bill Tomberlin 1 Ehlrick, SW NW 12-4n-60w. The first offset discovery at West Bijou, Williamson - Kissinger 1 Conine, C SE SW 1-4n-60w, flowed 42 bbl. of oil per hour.

This new field is one of the basin's best discoveries in many months.

The past few months have seen new life in Denver basin drilling, particularly in the Colorado portion which was near-dormant for many months.

DENVER BASIN exploration is enjoying a reawakening stirred on by the recent West Bijou field discovery in Morgan County, northeastern Colorado.

In Wyoming . . . The first Denver basin success in southeastern Wyoming in some time is Wyoming Western Oil Co.'s 1 Scheel in SW SW 21-16n-61w, Laramie County.

The operator completed the confirmation discovery for 140 bbl. of oil per day on pump. The producing zone is the Dakota "J" sand at 7,704-20 ft. Wyoming Western's discovery is a north offset to the 1 Hanson, a 1957 discovery in the "J" sand.

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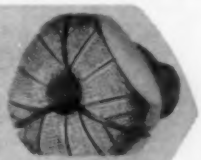

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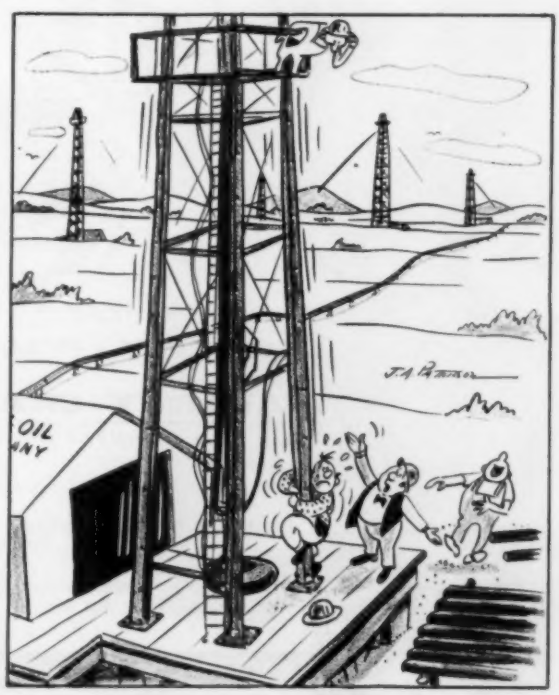


"Look, Monely, you don't have to work up on top of the tower if you feel that way."

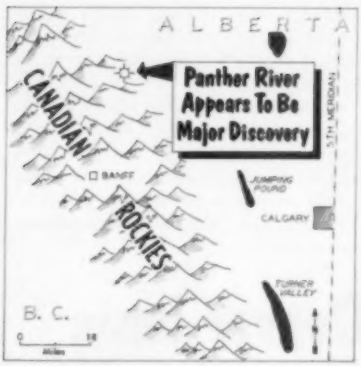
In Canada

Foothills search moves into Rockies

ALBERTA'S most significant gas strike of the year appears to be Shell Oil Co. of Canada, Ltd., 1 Panther River, 28 miles north of Banff inside the Rocky Mountains.

Shell found Devonian sour gas at the maximum rate of 7,200 M.c.f. per day during tests. The drill-stem test was taken at 9,009-9,166 ft.

The Panther River wildcat, which lies on LSD 5, 19-30-10w5, is just outside the Banff National Park limits. Located in the Rocky Mountains it is of high significance. This is another link in the trend of gas fields being opened up and down the length of the Rockies in Alberta, starting at Waterton Park in the south and stretching up along the front towards British Columbia.



ALBERTA'S PANTHER RIVER Devonian gas discovery appears to be of considerable importance, since it is producing from Devonian rather than Mississipian as do most fields along the Rocky Mountain front in Alberta.

Most of these gas fields produce from the highly prolific Mississippian formation. The Panther River wildcat and Lambert Creek are the only Devonian finds in this extensive search. Mountain Park field, another gas area in this region, has Triassic production. Panther Creek is a Nisku-Devonian producer, while Lambert Creek, Canada's deepest hole at 15,000 ft. plus, is a Devonian D1 gas well.

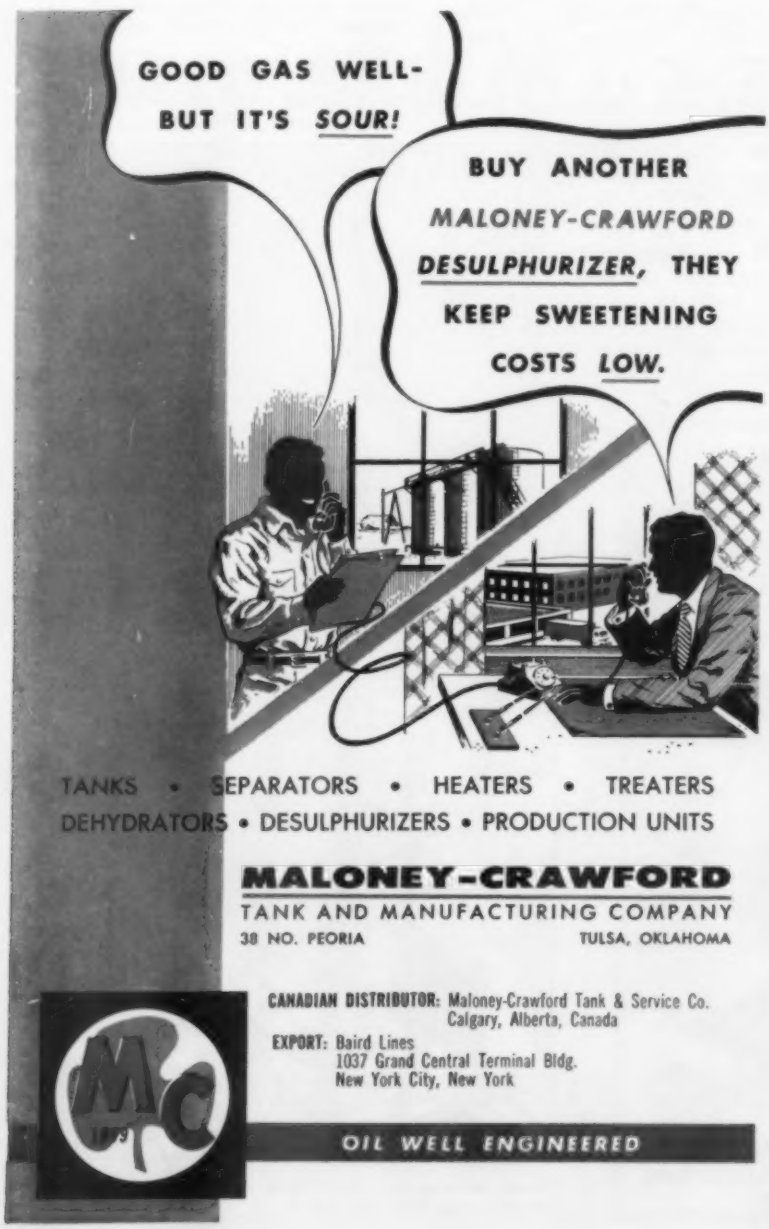
Kaybob gets Devonian gusher

COMPLETION of an important step-out well in the Kaybob area of Alberta, Canada, 2¾ miles south of the discovery well on a 5,120-acre Crown lease has been announced by Phillips Petroleum Co.

The new A-10-3 Kaybob flowed at a daily rate of 3,274 bbl. of 45.3°-gravity oil through a ¾-in. choke from the Devonian Beaverhill Lake formation at a depth of 9,700 ft.

The lease on which the well is located was selected from a 69,120-acre Crown reservation after completion of the discovery well last spring, and 5,120 adjoining acres were reserved for the Crown. The lease as well as the remaining portion of the reservation, which is 145 miles northwest of Edmonton, is owned one-third each by Phillips, British American Oil Co., Ltd. and California Standard Co.

This well follows by a few weeks completion of the second well on the lease which was located 1 mile southwest of the discovery and is comparable to the other two wells. The A-10-3 Kaybob is located in LSD 10, 3-64-19w5.



North Dakota county bags twin strikes

RENVILLE COUNTY has two Mississippian discoveries in the mill — the latest important strike in this border county is at Anschutz Drilling Co. 1 Christensen, 23 miles southwest of Newburg field, closest production. Near the border of Canada, Gulf Oil Corp. is still testing at its apparent discovery 5 miles northeast of Bluell field.

ONE-FIELD Renville County on North Dakota's northern border appears headed for two new discoveries, one on the border, the other in the far eastern panhandle portion of the county, 23 miles southwest of nearest production.

Anschutz Drilling Co. is still testing at its 1 Christensen in C NE NW 7-158n-81w, 23 miles southwest of Newburg field in far eastern Renville County after pumping oil at the hourly rate of 10 bbl. from 4,473-77 ft. in the Mission Canyon-Mississippian. After acid treatment the operator swabbed oil at the rate of 20 bbl. per hour for 4 hours. There has been no drilling whatsoever within 4½ miles of this indicated strike.

Border strike . . . Gulf Oil Corp. pumped 93 bbl. of oil in 4 hours at its 1 Busch & Nemaha Royalty Co. wildcat along the border, 5 miles northeast of Bluell field. The pump test was of perforations at 4,204-20 ft. in the Mission Canyon. Previously, the well flowed by heads at the hourly rate of 11 bbl. This indicated strike is just 1½ miles south of the International border.

Confirmation Well Is Heath, Madison Producer

The confirmation well to Scoria field in Billings County, southwestern North Dakota, is both a Heath and Madison producer. Amerada Petroleum Corp.. 2 Scoria Unit, C SW SW 2-139-101w, flowed 275 bbl. of oil per day on 12/64-in. choke and 10 bbl. of water. From the Madison the well made 252 bbl. of oil per day on 14/64-in. choke.

Scoria was opened early in January as a Madison producer. The 3 Scoria Unit, N½ NE SW 11-139n-101w, southeast extension try, is drilling below 5,700 ft.

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Honorary Memberships Set for SEPM Meet

The Research Committee of the Society of Economic Paleontologists and Mineralogists has unanimously nominated and the Society's Council has elected three honorary members.

They are: Marcus Albert Hanna, of Houston, Charles Elijah Decker, of Norman, and Hans Ernst Thalmann, of Stanford, Calif. The honorary membership certificates will be formerly presented to them at the Society's 32nd annual meeting in Los Angeles on Tuesday, March 11, 1958.

New Books For Oil Finders

Rinehart Oil News Co., Box 1208, Dallas, announces the release of its 1957 Structure Maps of Texas Oil Fields, a reference book containing 251 map exhibits as submitted during the past year to the Texas Railroad Commission for rulings on field discoveries, injection projects, and Rule-37 Permits.

The material represents all exhibits suitable for reproduction. It is arranged alphabetically by counties, by Texas Railroad Commission districts, and is bound into a single, indexed volume. Each map is identified according to county, district, producing formation, contoured interval, and type of hearing.

Copies of the new book are being shipped to prepublication subscribers, with the remaining portion of the press run available for general sale.

Successful Wildcats

ALBERTA

Canadian Seabord et al 9-17 Chigwell, LSD 9, 17-40-25w4. D2 oil discovery. TD 6,727 ft.

Texaco 16-29 Thompson Lake, LSD, 29-40-11w4. Basal quartz oil discovery. TD 3,300 ft.

Union 10-1-88-9 Red Earth Creek, LSD 10, 1-88-9w5. Granite wash oil discovery. TD 4,768 ft.

Great Plains 11-20 East Harmattan, LSD 11, 20-32-3w5. Mississippian gas discovery. TD 8,478 ft.

NORTH ARKANSAS

Johnson County: Gulf 1 W. H. Tackett, C SW NE 2-8n-22w. IP 8,000 M.c.f. of gas per day, Atoka 3,308-72 ft. TD 7,525 ft. New pool.

ILLINOIS

Saline County: Hal Lobree 1 Jess Clarida, SE NE SE 20-8s-5e. IP 52 BOPD, 31 BWPD, Aux Vases 2,899-2,902 ft., 2,903-06 ft., 2,908--12 ft. TD 3,040 ft. Extends Harco pool.

Marion County: Wausau Petroleum Corp. 1-D R. Young, SW NW 7-2n-2e. IP 75 BOPD, McClosky 2,,084-96 ft. TD 3,525 ft. New pay in Odin pool.

Effingham County: Slagter Production Corp. 1 Selma Wenthe, SE NE NE 24-7n-5e. IP 60 BOPD, 60 BWPD, Rosiclare 2,414-18 ft. TD 2,647 ft. Oil discovery of Watson pool.

Christian County: Henson Drilling Co. 1 Hoysley, SE SE SW 30-15n-1w. IP 10 BOPD, 5 BWPD, Silurian 1,925-31 ft. TD 1,986 ft. Extension to Mount Auburn Consolidated pool.

INDIANA

Spencer County: William H. Beshears 1 E. Killion, SE SE SE 7-6s-4w. IP 17 BOPD, Rosiclare 968-73 ft. TD 990 ft. New pay in Newtonville pool.

Delaware County: L. O. Baggett 1 Jules La Duron, SW NE 18-20n-11e. IP 20,000 M.c.f. of gas per day, Trenton 891-97 ft. TD 2,504 ft.

KENTUCKY

Christian County: Tom McMahon 1 Edgar Clark, 3-G-24. IP 200 cu. ft. of gas per day, Benoist 1,028-52 ft. TD 1,230 ft. Opens Adam gas pool.

Muhlenberg County: Searles & Baggs 1 A. Sherrod, 17-I-28. IP 1,500 M.c.f. of gas per day, Benoist 1,745-55 ft. TD 1,755 ft. Opens Sharon School pool.

Henderson County: R. W. Portis and Universal Drilling Co. 1 Roy E. Duncan, 22-O-25. IP 30 BOPD, 50 BWPD, Tar Springs 1,598-1,612 ft. TD 1,983 ft. New pay in Rougers Landing pool.

Daviess County: J. R. Fisher-H. E. Beane 2 G. Rhoades, 4-O-32. IP 18 BOPD, 30 BWPD, Tar Springs 715-28 ft. TD 728 ft. Opens North Berry Schools pool.

MONTANA

Roosevelt County: Murphy, Placid, Phillips, Cartetr 101 East Poplar, 14-28n-51e. IP 137 BOPD, 40.2°, "C" zone 5,891-96 ft. TD 6,255 ft. New pay in Mission Canyon or Charles C-5.

Valley County: Northern Natural Gas Co. 1-A Borteen, 3-29n-36e. Shut in gas well. Bowdoin 1,454-68 ft., 1,482-92 ft. TD 1,859 ft.

NORTH DAKOTA

Billings County: Amerada Petroleum Corp. et al 1 Scoria Unit, C NE NE 10-139n-101w. IP 328 BOPD, 13 BWPD, 39.6°, and 38.4°, Heath 7,973-79 ft.; Madison 9,213-58 ft. TD ,46 ft. Heath and Madison discovery in pool.

McKenzie County: Amerada-Texas 1 Angus Kennedy, C NW NE 29-151n-96w. IPF 374 BOPD, 45.2°, Madison 9,244-74 ft. TD 9,488 ft. Madison discovery.

Williams County: Amerada 1 Iverson-Nelson Unit "A," IPF 554 BOPD, 31 BWPD, 52.6 and 43°. Devonian 10,194-10,502 ft.; Silurian 11,499-11,568 ft., 11,594-11,562 ft. TD 11,778 ft. Deep discovery in Beaver Lodge field.

Amerada 1 Iverson-Nelson Unit, C NE 2-155n-96w. IPF 513 BOPD, 54 BWPD, 40.9 and 50.5°, Devonian 10,145-10,460 ft., 10,279-10,350 ft., 10,360-80 ft., 10,390-10,460 ft., Silurian 11,441-11,766 ft., 11,556-11,616 ft., 11,628-80 ft., 11,696-11,766 ft. TD 13,615 ft. New pays in Beaver Lodge field.

Amerada 1 Herfindahl-Kvam Unit, SE NE 26-156n-96w. IPF 647 BOPD, 23 BWPD, 42.2 and 47.9°, Devonian 10,226-11,474 ft., 10,492-10,522 ft.; Silurian 11,578-11,744 ft. TD 11,887 ft.

Burke County: Northwest Drilling Co. 1 Olson, C NW NE 18-162n-90w. IP 91 BOPD, 20 BWPD, 36.4°, Midale 5,838-56 ft., 5,856-62 ft. Midale zone discovery. TD 6,315 ft.

Central LeDuc 1 Bird, C SE SW 18-163n-90w. IP 50 BOPD, 25 BWPD, 39°, Midale 5,723-34 ft. TD 6,203 ft. Midale zone discovery.

Petroleum Corp. of America et al 1 Nygaar, C SE NE 29-163n-90w. IP 50 BOPD, 39°, Midale 5,718-28 ft.; Nesson 5,729-39 ft. TD 6,136 ft. Midale-Nesson discovery.

PENNSYLVANIA

Somerset County, Jenner Township: Peoples Natural Gas Co. 1-4150 C. E. Williams, elev. 2,575 ft., 10,283,000 cu. ft., gas after fracturing in chert, Onondaga 8,026 ft., chert 8,048 ft. TD 8,152 ft.

SASKATCHEWAN

Imperial 6-13 Hummingbird, LSD 6, 13-2-19w2. Indicated Red River oil discovery. TD 10,371 ft.

British American - Imperial - Calvan 16-10 Best, LSD 16, 10-4-34w1. Mission Canyon discovery. TD 4,055 ft.

NORTH TEXAS

Jack County: Republic Natural Gas Co. 1 Hollis Lewis, E. Wray Sur., A-882, 8 mi. NE Jacksboro. IP 84 BOPD, 12/64-in. 42°, GOR 1890, TP 600 psi., conglomerate 5,427-33 ft. TD 5,635 ft.

Wise County: Christie, Mitchell & Mitchell 1 Garrison, Thomas Baker Sur., A-45, 6 mi. E Chico. IPP 8 BOPD, 42°, Strawn 2,748-52 ft. TD 6,102 ft.

Southern Union Gas Co. 1-A Waggoner, J. C. Logan Sur., A-494, 1½ mi. SE Decatur. IP 720,000 cu. ft. gas, some condensate, conglomerate pay 5,930 ft. TD 6,644 ft.

WEST CENTRAL TEXAS

Taylor County: Jocelyn Varn Oil Co. 1 H. E. Nicholas, Sec. 150, Blk. 64, H&TC, 5½ mi. NE Shep. IP 185 BOPD, ½-in., 45°, GOR 506, TP 150 psi., upper Fry 4,557 62 ft. TD 5,325 ft.

WEST TEXAS

Culberson County: Ford Chapman & Associates and W. D. Thorn 1-3 TXL "A," Sec. 3, Blk. 58, Twp. 2, T&P Sur., 10 mi. NW Orla. IP 279.8 BOPD, 14/64-in., 43.5°, GOR 643, TP 495 psi., top Delaware pay 2,580 ft. TD 2,589 ft. Ground elevation 3,153 ft.

Kent County: R. J. Zonne 1 W. A. Mays, Sec. 36, Blk. 4, H&GN Sur., 9 mi. SW Clairemont. IP 159 BOPD, 24/64-in., 41°, GOR 500, TP 225 psi., Pennsylvania reef 6,800-18 ft. TD 7,200 ft.

Reeves County: W. D. Thorn et al 1 TXL, 19-56-T&P, ½ mi. N Orla. IP 90 BOPD, 8/64-in., 41°, GOR 400, 400 psi., Delaware sand 3,029 ft. TD 3,036 ft.

Toyah Oil Co. 2 Regan-State, 9-59-PSL, 17 mi. NW Toyah. IPP 6 BOPD, 24°, pay 105 ft. TD 200 ft.

TEXAS GULF COAST

Orange County: W. V. Bowles & Co. 8 M. Granger heirs, William Dyson Sur., A-10 (1 mile southeast of Orangefield). IP 180 BOPD, 5/32-in., 26.8°, GOR 1,855 cu. ft. per barrel, TP 1,025 psi., perfs. 4,745-49 ft. (Catahoula). TD 5,224 ft. (New pay—south flank Orange field.)

SOUTHWEST TEXAS

Zapata County: Gulf Resources, Inc., 1 Manuel Ramos Ramirez, Porcion 17, Share 1-A (5 miles southeast of Lopena). IP 4,450 M.c.f. daily, ¾-in., TP 3,850 psi., perfs. 8,510-80 ft. (Wilcox). TD 10,215 ft. (New reservoir and extension in Lopena area.)

Dick Kahle—an Individualist

. . . moves fast to put his independent Eastern States firm in the forefront of new developments in the oil industry.

WHEN THE fledgling Eastern States Petroleum Corp. was organized during the depression, the company had a struggle scraping together $50,000 as a down payment on a 1,500-bbl. topping plant at Houston.

Today that same plant is worth $50 million, and Eastern States has become one of the nation's liveliest independents. It has moved into petrochemicals and foreign exploration, expanded its marketing and production, and developed a reputation for never fearing to change directions in the cross currents of the oil industry.

The man at the helm of this going concern at Houston is R. B. (Dick) Kahle.

How it started . . . President Kahle, with nearly 20 years of oil experience behind him, formed the company with three associates in 1932. Originally its activities were concentrated in marketing along the eastern seaboard.

Then the partners plunked down $50,000 in 1934 as the first payment on a deepwater topping plant at Houston. They quickly stepped up production to 5,000 bbl. per day and added a thermal cracker the next year.

The policy of keeping the plant up-to-date has paid off. The company now has a modern installation on the Houston Ship Channel. It was the first to install a Platformer expressly to produce aromatics and the first to build a Udex extraction unit. It now has three such units.

Kahle is sold on the future of the petrochemicals business and has geared the plant's operations to this field. As a result of his thinking, Eastern States produces only 20 per cent motor fuel from its throughput. The company markets its chemical output both domestically and abroad. With a terminal at Rotterdam and a distributing arrangement at Leghorn, Italy, it can market its products throughout Western Europe.

A few months ago Eastern States changed its name to Eastern States Petroleum & Chemical Corp. and now operates under a single corporate tent. The company also recently moved its research department into a new half-million dollar research center.

His history . . . Although Kahle credits his associates with the sparkling growth of Eastern States, there is no doubt that he has been the dynamic force behind it.

He was born in 1892 at Lima, Ohio, and earned a civil engineering degree at Allegheny College in 1913. After 2 years in general engineering, he joined Standard Oil Co. (N.J.), worked in its general-engineering department, and then became chief engineer and assistant superintendent of the Halifax refinery, operated by Jersey's subsidiary Imperial Oil, Ltd.

After World War I army duty, Kahle was assigned to the office of Jersey President Walter Teagle, worked on special assignments, and eventually became vice president of Jersey's marine division.

In 1923 Kahle left Jersey to get his first taste of independent refining. As president of Louisiana Oil & Refining Co., Shreveport, he moved the company from the red to the black before it was sold in 1928.

Meanwhile, the same banking interests which hired him for Louisiana installed him as president of Beacon Oil Co., with a refinery at Everett, Mass. He held both presidencies for a while and then concentrated on Beacon until it was sold in 1930 to his old employer—Jersey Standard.

For 2 years Kahle was back at his old stand as vice president of Jersey's shipping division.

Then, in 1932, Kahle joined with Joseph F. McCarthy, formerly with

Personals

Lysle A. Gust, production engineer, has been transferred to Jackson, Miss., from Tulsa by Carter Oil Co.

Oscar Wolfe, former chief engineer of Texas Pipe Line Co., War Emergency Pipeline, and Trans Arabian Pipe Line Co., and a pioneer in development formulas for oil-pipeline hydraulics, last week was made an honorary member of the Pipe Liners Club of Tulsa. Wolfe is active as a consultant in Tulsa.

Billy F. Burke has been promoted by Carter Oil Co. from senior engineer in Tulsa to division reservoir engineer in Shreveport, La.

B. E. Warren, Latin America division manager for Sun Oil Co.'s foreign operations department, has transferred to Caracas from Dallas in a move which relocates division headquarters. Also transferring to Caracas from Dallas are **P. W. McFarland,** division chief geologist; **Lee C. Smith,** division assistant chief geologist; and **John Waller,** district geophysicist.

A. B. Crowther, Jr., has joined Humble Oil & Refining Co. in Midland, Tex., as petroleum engineer.

Herbert H. Lank, president of DuPont Co. of Canada, Ltd., has been elected a director of Hudson's Bay Oil & Gas Co., Ltd.

Lawrence D. Christian has been promoted by Humble Oil & Refining Co. from senior petroleum engineer in the Gulf Coast division office, Houston, to district petroleum engineer in Liberty, Tex.

Sinclair, and two other former business associates, L. J. Walsh and David Armstrong, to form Eastern States. McCarthy is now vice president and chairman of the board. Walsh and Armstrong are deceased.

The man . . . Kahle, as a man, is an individualist—with the highest respect for the individual. He ramrods his company on an independent basis and knows how to move fast in an industry where fast-moving is essential to stay in business. At the same time he keeps full faith in his employes. And this reliance is returned multifold in loyalty and performance. Eastern States has an independent union that hasn't had a strike in 25 years.

When times are tough, he speaks frankly to employes. In the early days Eastern States paid below-average wages, and the workers stuck by him. Today their average income tops that of the average in an area dominated by major refineries and chemical plants.

In hopes of bolstering its crude production, the company has gone abroad. It has a 1,500,000-acre concession in Panama and plans an immediate basic geological survey (OGJ, Jan. 13, 1958, p. 73).

Other interests . . . Despite his heavy workload, Kahle still has time for many civic, church, activities.

He served 3 years as chairman of the Houston Chamber of Commerce Industrial Committee on Air and Stream Pollution, headed a building fund committee for the Houston Lighthouse for the Blind, and currently heads the Harris County March of Dimes campaign. He has served 6 years on the National Council of the Protestant Episcopal Church.

He and Mrs. Kahle have three grown children. Dick, Jr., is vice president in charge of foreign petroleum and chemical sales for Eastern States. A son-in-law, James F. Horsey, is in the chemical sales department.

George T. Hansen, chairman of the board of Utah Southern Oil Co., will retire April 21.

J. C. Andries, assistant district superintendent with Humble Oil & Refining Co., has been transferred to Paradis, La., from Franklin, La.

L. James Schmauch and **Helen Sellei Beretvas** have been appointed senior research scientists by Standard Oil Co. (Ind.). Schmauch will be in the analytical research division and Dr. Beretvas in the lubricants division.

Donald J. Ebbs, Jr., Phillips Petroleum Co. production engineer trainee, has been transferred to Odessa, Tex., from Eureka, Kans.

J. T. Cawley, deputy minister of mineral resources for Saskatchewan, has been appointed petroleum exploitation adviser on the United Nations technical assistance mission to Pakistan.

Richard R. Wilber, assistant supervisor in the crude-oil coordination department of Standard Oil Co. (Ind.) in Chicago, will become assistant manager of crude oil supply for American Oil Co., an affiliate, next month. He will headquarter in New York.

Tom Egan, independent operator, has been elected president of Indiana Oil and Gas Association. **John Buchman,** independent, is first vice president. **Roy Ralston,** Phillips Petroleum Co., has been elected second vice president, with **E. J. Reading,** Sun Oil Co., as secretary-treasurer.

L. C. STRATTON

L. C. Stratton has been promoted from assistant division production superintendent for Sinclair Oil & Gas Co. in Fort Worth to division production superintendent there. He succeeds **John T. Reeves,** who will retire this year. Stratton had been assistant in Fort Worth since 1949. Reeves, a former division superintendent for Sinclair in Tulsa, Independence, Kans., and Midland, Tex., became division superintendent in Fort Worth in 1954.

Harold E. Nissen, Signal Oil & Gas Co., has been elected chairman of the Los Angeles Basin chapter of American Petroleum Institute. **Paul Hamann,** E. B. Hall & Co., will serve as vice chairman. **Karl M. Mercer,** Servco Corp., is secretary-treasurer, with **Jack Augsburger,** Tryad Service Corp., as assistant secretary-treasurer.

Eduardo J. Guzman, president of the Mexican Association of Petroleum Geologists, has been named to a four-man executive committee of the association along with **Carlos Castillo Tejero,** vice president; **Alejandro Calderon,** secretary-treasurer; and **Javier Meneses,** editor. Castillo is general chairman of the association's convention, scheduled for March 23-30 in Mexico City. Vice chairmen are **Luis Benavides** and **Armando Eguia.**

Personals

VERN TAYLOR

Vern Taylor, western regional manager of the producing department of Imperial Oil, Ltd., has been elected chairman of the board of governors of Canadian Petroleum Association. He succeeds **R. C. Brown,** president of Hudson's Bay Oil & Gas Co., Ltd., who will continue as a board member. Newly elected to the board of governors are **Paul L. Kartzke,** Shell Oil Co. of Canada, Calgary; **W. C. Howells,** McColl-Frontenac Oil Co., Ltd., Calgary; **C. O. Nickle,** Conick Petroleums, Ltd., Calgary; **E. C. Babson,** Union Oil Co. of California, Calgary; **A. F. Beck,** Canadian Prospect, Ltd., Calgary; **J. S. Black,** South Saskatchewan Pipe Line Co., Regina; and **H. G. Sehnert,** Sohio Petroleum Co., Regina.

Harry Weber, chemist for Gulf Oil Corp. in Port Arthur, Tex., has been promoted to laboratory foreman for Gulf Refining Co. in Toledo, Ohio.

Marion J. Epley, Jr., general attorney in New York for The Texas Co., has been appointed assistant to the board chairman.

Carroll Maddox, geologist with Sinclair Oil & Gas Co., has been transferred to Albuquerque from Casper, Wyo.

E. (Pick) McIver, West Coast crude-oil purchasing agent for Shell Oil Co., has retired. McIver joined Shell in 1932.

Greg Cannon has been appointed vice president in charge of exploration for Buffalo Oil & Gas Co., Denver. He succeeds **R. E. Eckels,** who has retired.

C. Wilbur Brady, assistant division superintendent for Sinclair Oil & Gas Co.'s gas and gas-products department, has been transferred to Midland, Tex., from Houston.

David H. Levy, general superintendent of Magnolia Pipe Line Co.'s communications and electrical department and a director of the company, will retire March 1. He joined the company in 1927, became general superintendent of the department in 1943, and a director last year.

Personals

E. R. JONES

E. R. Jones has been named supervisor of all operations of Derby Refining Co.'s Wichita, Kans., refinery. He succeeds **Frank W. McCurry,** vice president in charge of manufacturing, who has retired. Jones has been with Derby since 1939. McCurry joined the company in 1923 and has been vice president in charge of manufacturing since 1931. He will continue as a director and consultant to Derby.

Lawrence N. Ott, Tidewater Oil Co., has been elected 1958 president of the Southwest Louisiana Geophysical Society. Other officers are **Neal Clayton,** Sohio Petroleum Co., first vice president; **G. E. Tilley,** Sohio, second vice president; **James M. Moore,** Skelly Oil Co., secretary; **James M. Wheat,** Sinclair Oil & Gas Co., treasurer; and **Edmund L. Ricketts,** Forest Oil Corp., district representative. All are from Lafayette.

Paul H. Waddle, formerly southern division reservoir engineer for Carter Oil Co. in Shreveport, La., has opened consulting engineering offices in Shreveport.

Cecil Holler has been transferred by Sinclair Pipe Line Co. from Wichita Falls, Tex., where he was district superintendent, to Shawnee, Okla., in the same capacity.

Donald O. Swan, assistant general manager of Esso Standard Oil Co.'s manufacturing department since mid-1957, has been named head of the new petroleum specialties department.

Tom Gaines, chief petroleum engineer for Texaco Exploration Co. in Calgary, has been transferred to Texas Petroleum Co. as manager of the Colombian producing division at Bogota. **B. M. Woofter** has succeeded Gaines as chief petroleum engineer in Calgary. He was formerly chief petroleum engineer there. **Fielder A. Jones,** superintendent of The Texas Co.'s Pacific Coast pipelines division, Los Angeles, has also transferred to Texas Petroleum. He will be assistant manager (pipelines) of the Venezuelan producing division, Caracas.

Pearce Elected by Tulsa Nomads

New officers of the Tulsa chapter of Nomads held their first meeting recently with John Pearce, third from left, of Superior Iron Works, presiding. Other 1958 officers are left to right, Harry Horton, Petrolite Corp., treasurer; W. O. Timberlake, Lucey Products Corp., assistant secretary; Pearce; Vern Bailey, Bethlehem Supply Co., sergeant-at-arms; E. L. Thomas, independent, executive secretary; Floyd Cummings, Axelson Manufacturing Co., assistant treasurer; and Guy Williams, Dowell Incorporated, immediate past president, senior regent. Not pictured are Oscar Irizarry, Petroleo Interamericano, vice president; T. M. Lumly, Refinery Engineering Co., secretary; Paul McGivern, McKissick Products Corp., junior regent; and E. M. Donovan, Martin-Decker Corp., deputy sergeant-at-arms.

B. P. KANTZER

Basil P. Kantzer, manager of operations for Union Oil Co.'s Gulf Coast division, was installed as 1958 president of Society of Petroleum Engineers of AIME at the annual AIME meeting last week. He succeeds **John P. Hammond** of Amerada Petroleum Corp., Tulsa. Vice presidents are **B. L. Francis,** assistant division manager in New Orleans for The Texas Co., and **E. N. Van Duzee,** production manager of Shell Oil Co.'s Midland, Tex., area. Five new directors installed include **R. A. Morse,** Gulf Research & Development Co.; **Harry D. Campbell,** Franco Western Oil Co.; **Roy A. Bobo,** Phillips Petroleum Co.; **Raymond E. Howard,** Atlantic Refining Co.; and **Raoul J. Bethancourt,** Sun Oil Co.

George L. Mann has been transferred by Warren Petroleum Corp. from Maud, Okla., to Fairbanks, Tex., where he will be gasoline plant superintendent.

H. O. Stallings, formerly with Richardson & Bass in Fort Worth, has joined Tennessee Gas Transmission Co. in Oklahoma City as senior petroleum engineer.

Glen V. Mulcahy, senior geologist in Houston for Sohio Petroleum Co., has been transferred to Lafayette, La. **Calvin C. Chimene,** geologist, has been transferred to Houston from Lafayette.

Earl Foster, executive secretary of Interstate Oil Compact Commission since 1944, has been named general counsel for the compact. **Lawrence R. Alley,** assistant executive secretary, will be acting executive secretary replacing Foster.

C. E. Thornton has been promoted from vice president to executive vice president of Reading & Bates Offshore Drilling Co. He will continue to headquarter in Tulsa. **George L. Temple,** general manager at New Orleans, has been named vice president. **Frank J. Garnett** has been transferred from the Calgary office of Reading & Bates Drilling Co., Ltd., to New Orleans as assistant to Temple. **N. Glen Watson** has transferred from Reading & Bates, Inc., in Oklahoma City to Calgary as assistant to **Steven W. Shambaugh,** vice president and general manager of Reading & Bates Drilling.

Billings AIME Petroleum Section Elects

Fraser M. Burback, second from right, of Mobil Producing Co., has been elected 1958 chairman of the Billings, Mont., section of Society of Petroleum Engineers of AIME. Other officers are, left to right, Earl J. Whitaker, Northern Pacific Railway Co., director; Don M. Madden, Mobil Producing, secretary-treasurer; Nick J. Matthews, Shell Oil Co., first vice chairman; Charles B. Evans, Schlumberger Well Servicing Corp., second vice chairman; Burback; and Robert L. Dickson, Dowell Incorporated, director. Not pictured is Richard L. Brown, Sanderson & Brown, director. Whitaker is immediate past president

Harry J. Kennedy, Continental Oil Co.'s administrative vice president in charge of marketing since 1936, has been appointed a senior vice president.

Fred R. Haeberle, Abilene, Tex., consultant, has joined Venezuelan Atlantic Refining Co. in Caracas as electric analyst.

Augustus C. Long, chairman and chief executive officer of The Texas Co., has been elected a director of Freeport Sulphur Co.

Gen. Ernest O. Thompson of the Texas Railroad Commission has been reappointed chairman of the legal committee of Interstate Oil Compact Commission. Thompson has held the post 8 years.

Mark C. Sykes, Skelly Oil Co.'s southern area production superintendent, has been named assistant production manager. **Vern E. Fletcher,** formerly northern area superintendent, will succeed Sykes. **Barton W. Ratliff,** petroleum engineer, has been promoted to northern area superintendent. **Leland Franz,** petroleum engineer, will take over the new post of assistant superintendent of the western Kansas district.

Everett H. Almond, plant superintendent with Warren Petroleum Corp., has been transferred to Holliday, Tex., from Fairbanks, Tex.

DEATHS

Delbert Y. Hewitt, 48, president of Leonard Crude Oil Co., Mount Pleasant, Mich., **William Elliott,** 39, manager of crude-oil purchases, and **Stanley King,** 34, pilot for the parent Leonard Refineries, Inc., were killed when their company plane crashed February 15 near New Buffalo, Mich. They were enroute home from a business trip to Tulsa. Earlier the same day, **Gordon Anderson,** 34, vacuum unit operator at the parent company's Alma, Mich., refinery, was killed when fire struck the main Alma plant.

Edward F. Maneely, 79, president of John Maneely Co., Wheatland Tube Co., and Wheatland Steel Products Co., died February 7 in Philadelphia.

Winfred R. Goddard, 66, retired general products superintendent for General Petroleum Corp., died February 9 in San Diego, Calif. Goddard retired 3 years ago.

William M. Irish, Jr., Wynnewood, Pa., former president and director of Atlantic Refining Co., died February 13 in St. Petersburg, Fla. He was 89. Irish was with Atlantic 46 years before retiring in 1937. He became vice president of the company in 1915 and was president from 1927 to 1937.

E. G. (Doc) Thompson, Mount Pleasant, Mich., independent producer and pioneer Michigan oil operator, died February 8. He was 61. Thompson had operated in Michigan since the first Saginaw boom in 1927.

John L. Gilligan, 61, Mount Pleasant, Mich., cable-tool driller, died February 12.

D. D. Godbold, 73, retired engineer with the old Mid-Continent Petroleum Corp., died February 16 in Tulsa.

Asa A. Bailey, 67, Tulsa independent producer, died February 13 in Tulsa.

Personals

Norman C. Miller, acting chief geologist for Delhi-Taylor Oil Corp. since October, has been named chief geologist.

Paul W. Schaub, formerly exploitation engineer in Shell Oil Co.'s Billings, Mont., division, has joined Gulf Research & Development Co. as research engineer in the drilling section.

Stewart S. Kurtz, Jr., head of Sun Oil Co.'s analytical division of research and development at Marcus Hook, Pa., has been appointed research scientist, a new position. **W. Herman Barcus,** manager of product development division, has been named manager of a new research service division. **Robert W. Donahue** will succeed Barcus in product development.

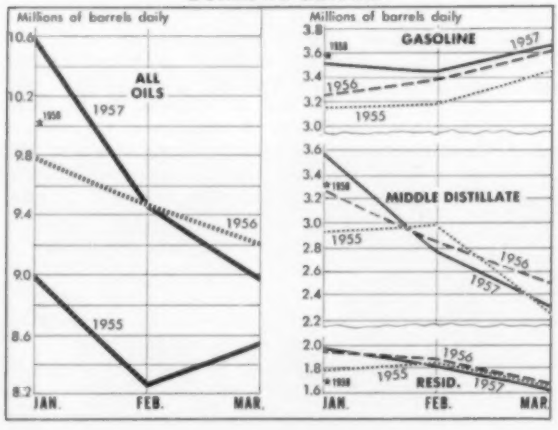
Fletcher F. Farrar, Farrar Drilling Co., Mount Vernon, Ill., has been elected 1958 chairman of the Illinois Basin section of Society of Petroleum Engineers of AIME. Other officers are **Bill G. Harmon,** B. G. Harmon Service & Equipment Co., first vice chairman; **James A. McCarty,** Shakespeare Oil Co., second vice chairman; **Elmer A. Milz,** Shell Oil Co., secretary-treasurer.

Latest Figures . . . Industry Trends

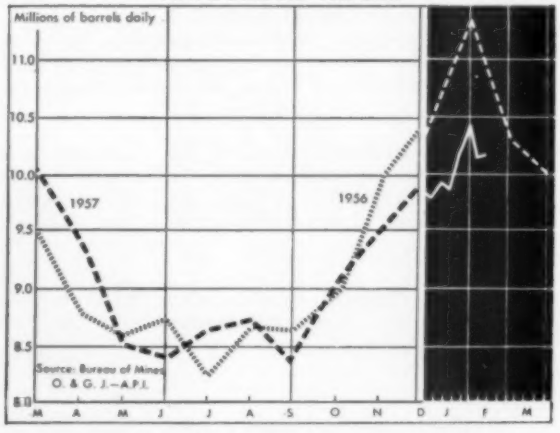
A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WELL	Change from WEEK AGO		Change from YEAR AGO	
Production	6,863,500	DOWN	17,500	DOWN	826,237
Crude stocks	278,982,000	DOWN	2,239,000	UP	28,055,000
Completions	828	DOWN	61	DOWN	153
Refinery runs	7,520,000	UP	195,000	DOWN	456,000
Gasoline stocks	210,560,000	UP	2,517,000	UP	8,306,000
Kerosine stocks	20,487,000	DOWN	1,093,000	DOWN	2,065,000
Distillate stocks	108,417,000	DOWN	9,135,000	UP	17,032,000
Residual stocks	57,134,000	DOWN	493,000	UP	21,322,000
Four-product stocks	396,598,000	DOWN	8,204,000	UP	44,595,000
Total imports	1,897,500	UP	659,000	UP	428,800

DOMESTIC DEMAND



TOTAL DEMAND—ALL OILS 4-week moving average



January demand below par, but par was unrealistic

JANUARY was not as black as it has been painted. Petroleum demand for the month suffered from comparisons with records set in the same months of 1957 and 1956.

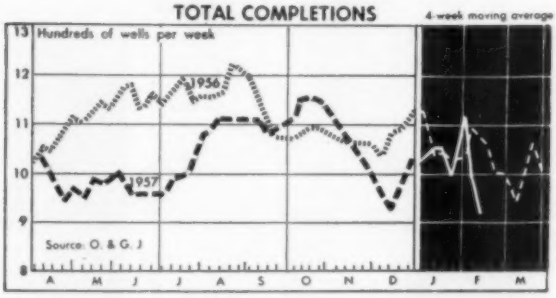
Part of the decrease in total demand last month was due to differences in exports. Total exports averaged 834,000 bbl. daily in January 1957 because of extra shipments during the Suez crisis. Current data on exports are not available, but with shipments back to normal the total probably is a little over 300,000 bbl. daily. This means that at least half a million barrels daily of the drop can be charged to abnormal export demand in January last year.

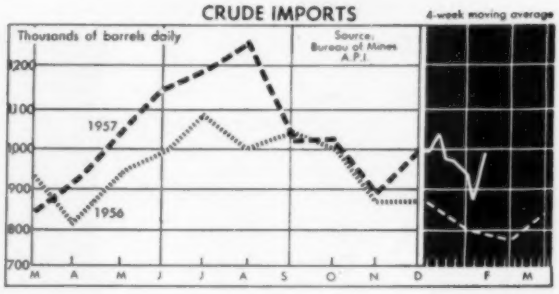
Even this half million will not account for the full January decrease. January's total demand was off a little more than a million barrels daily from last year. Since the drop in exports accounted for about half the total, domestic demand was down a little more than half a million barrels daily or about 5.5 per cent.

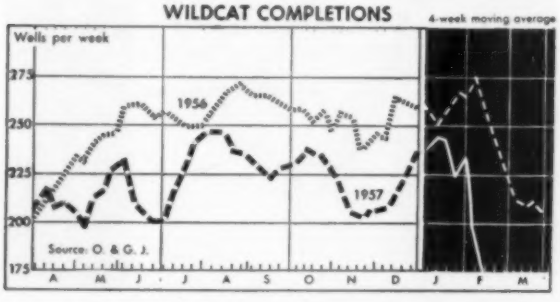
One reason for the poor showing in January was that the base for comparison was high. Actual domestic demand for January 1955 was 8,997,000 bbl. daily. The average for January 1956 was 9,773,000 bbl. daily for a gain of 8.6 per cent. On top of this, demand gained 8.2 per cent by January 1957. The total gain of 17.5 per cent in 2 years set a high base for judging performance in January this year.

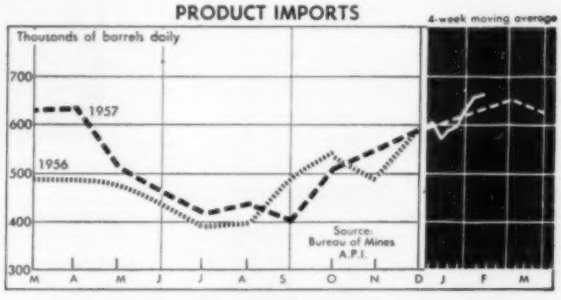
The domestic-demand chart shows these past gains in total domestic demand and also changes for major products. The decreases from last year were in light and heavy fuels. January domestic demand for gasoline was up a little from the year before.

Middle-distillate demand was about 8.4 per cent below last year with most of the loss charged to the weather. Residual demand dropped over 15 per cent. Part of the loss was to other fuels.







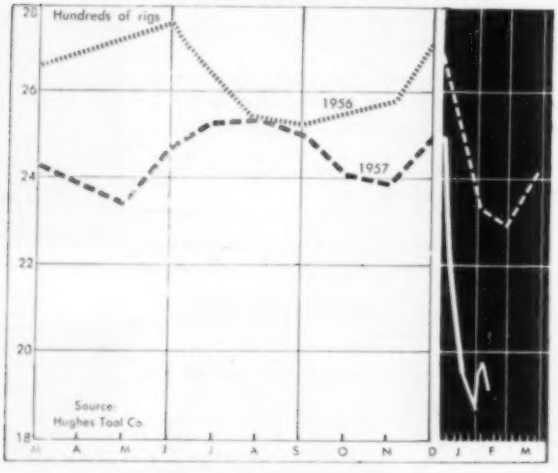


WEEKLY WELL COMPLETIONS . . . WEEK ENDED FEBRUARY 15, 1958

	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1958	1957	Total	Crude	Cond.	Gas	Dry	1958	1957
Alabama	1	0	0	0	1	0	8,528	9	4	1	0	0	0	1	5	3
Arkansas	14	11	0	0	3	0	39,332	102	155	2	0	0	0	2	19	23
California	35	24	0	1	10	0	160,348	271	281	8	0	0	0	8	48	78
Colorado	13	1	0	1	11	0	67,271	84	162	6	0	0	0	6	46	110
Illinois	28	16	0	0	12	0	64,022	256	336	6	0	0	0	6	54	82
Indiana	2	0	0	0	2	0	2,731	81	96	0	0	0	0	0	28	17
Kansas	60	32	0	2	22	4	207,880	502	583	10	1	0	1	8	113	107
Kentucky	5	0	0	0	5	0	4,779	120	210	0	0	0	0	0	15	46
Louisiana	64	34	5	5	20	0	594,810	454	506	8	2	1	1	4	57	87
North	18	9	0	3	6	0	86,660	153	215	2	0	0	1	1	25	23
South	34	15	5	2	12	0	390,832	237	216	6	2	1	0	3	29	55
Offshore	12	10	0	0	2	0	117,318	64	75	0	0	0	0	0	3	9
Michigan	6	3	0	0	3	0	17,138	44	52	1	0	0	0	1	15	24
Mississippi	9	2	0	0	7	0	73,326	64	39	6	1	0	0	5	37	18
Montana	7	4	0	0	3	0	28,626	62	44	3	1	0	0	2	34	17
Nebraska	7	2	0	0	5	0	40,887	84	103	5	2	0	0	3	43	61
New Mexico	36	24	0	5	7	0	183,247	324	268	7	2	0	0	5	55	45
West	17	9	0	5	3	0	84,980	161	99	2	0	0	0	2	25	16
East	19	15	0	0	4	0	98,267	163	169	5	2	0	0	3	30	29
New York	10	5	0	0	0	5	13,500	75	....	0	0	0	0	0	5	....
North Dakota	5	4	0	0	1	0	36,959	51	44	1	0	0	0	1	17	17
Ohio	22	12	0	3	7	0	57,317	115	131	0	0	0	0	0	3	2
Oklahoma	119	60	7	6	35	11	380,211	993	942	10	4	1	1	4	143	111
Pennsylvania	16	0	0	14	2	0	103,752	16	*41	1	0	0	0	1	1	*14
Texas	338	193	5	25	108	7	1,362,837	2,563	3,082	63	5	1	0	57	540	911
Dist. 1	13	2	0	0	11	0	34,810	121	155	8	0	0	0	8	50	64
Dist. 2	8	2	0	1	5	0	50,274	83	94	3	0	0	0	3	22	44
Dist. 3	25	11	1	2	11	0	179,930	182	268	2	1	0	0	1	31	93
Dist. 4	19	3	1	0	15	0	81,336	171	201	9	0	1	0	8	57	86
East	28	20	1	0	7	0	98,803	191	191	3	0	0	0	3	52	56
Dist. 7-B	49	29	0	1	19	0	108,817	308	426	11	1	0	0	10	99	172
West	102	87	1	1	13	0	491,419	766	822	10	3	0	0	7	117	142
Dist. 9	68	32	0	4	25	7	208,430	560	719	15	0	0	0	15	95	232
Dist. 10	26	7	1	16	2	0	109,018	181	206	2	0	0	0	2	17	22
Utah	9	7	0	0	2	0	50,849	57	18	1	0	0	0	1	10	11
West Virginia	7	0	0	7	0	0	29,036	92	98	2	0	0	2	0	3	8
Wyoming	12	5	0	1	6	0	79,621	103	115	6	0	0	1	5	44	41
Misc. (Tenn.)	3	1	0	0	2	0	1,480	20	12	2	0	0	0	2	15	6
Total U. S.	**828**	440	17	70	274	27	3,608,487	6,542	7,322	**149**	18	3	6	122	1,350	1,839
Total prev. week	889	468	20	76	303	22	3,697,737	.....	.....	175	21	1	7	146	.....	.....
Cum. 1958	6,542	3,268	150	497	2,482	145	27,580,747	.....	.....	1,350	123	16	59	1,152	.....	.....
Western Canada	50	35	0	5	10	0	298,387	303	288	15	1	0	0	14	96	68

*Including New York.

ROTARY RIGS OPERATING IN UNITED STATES



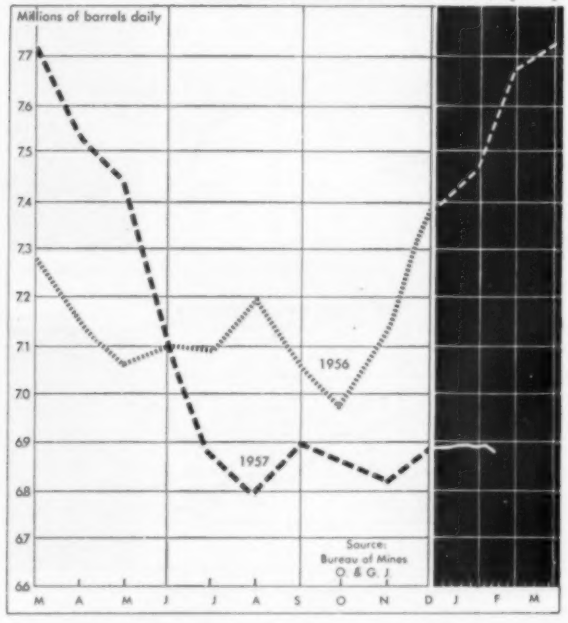
ACTIVE ROTARY RIGS*

	2-17-58	2-10-58	2-3-58	2-18-57
Alabama	8	10	11	7
Arkansas	22	16	16	14
Arizona	1	1	1	....
California	82	87	87	100
Colorado	37	36	35	39
Florida	1	1	1	2
Georgia	....	....	....	....
Idaho	....	....	....	1
Illinois	42	37	27	19
Indiana	5	4	....	....
Iowa	3	3	3	1
Kansas	121	124	119	158
Kentucky	9	2	....	5
Louisiana	325	326	337	451
North	31	29	32	49
South	232	231	234	292
Offshore	62	66	71	110
Maryland	....	....	....	1
Michigan	9	9	6	11
Mississippi	41	47	42	....
Missouri	....	....	....	23
Montana	27	26	28	14
Nebraska	20	17	15	28
Nevada	....	....	....	....
New Mexico	108	114	109	117
New York	1	1	1	....
North Dakota	34	33	33	18
Ohio	2	2	3	....
Oklahoma	186	205	197	238
Oregon	....	....	....	....
Pennsylvania	12	11	10	11
South Dakota	....	....	1	1
Texas	718	773	763	997
Gulf Coast	154	164	158	220
Offshore	4	4	4	8
West	307	314	316	373
North	209	250	247	340
East	44	41	38	56
Tennessee	....	....	....	....
Utah	40	40	45	33
Washington	....	....	....	1
West Virginia	4	4	4	1
Wyoming	53	53	53	45
Virginia	....	....	....	....
Total United States	1,911	1,982	1,947	2,336
Western Canada	241	214	226	240
Eastern Canada	....	....	1	....
Grand total	2,152	2,196	2,174	2,576

*Hughes Tool Co.

CRUDE-OIL PRODUCTION

4-week moving average



DAILY AVERAGE PRODUCTION FOR WEEK

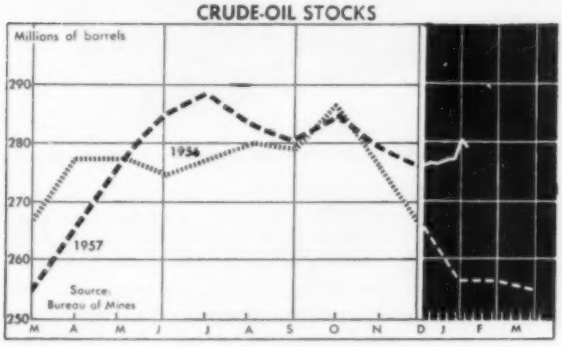
	February 15, 1958			Feb. 8
	Crude oil	Lease condensate	Total	total
Alabama	15,800	....	15,800	15,400
Arkansas	83,450	200	83,650	83,625
California	902,000	....	902,000	909,500
Colorado	138,600	....	138,600	139,600
Eastern	50,900	....	50,900	50,600
Florida	1,275	....	1,275	1,275
Illinois	235,700	....	235,700	235,100
Indiana	30,900	....	30,900	31,600
Kansas	†334,650	....	†334,650	†341,750
Kentucky	41,200	....	41,200	40,800
Louisiana	759,800	95,700	855,500	855,600
North	110,000	2,400	112,400	112,500
South	649,800	93,300	743,100	743,100
Michigan	26,400	....	26,400	25,300
Mississippi	98,900	4,950	103,850	103,850
Montana	75,200	....	75,200	74,900
Nebraska	54,575	....	54,575	54,650
Nevada	150	....	150	150
New Mexico	259,100	5,900	265,000	265,000
North Dakota	33,850	....	33,850	41,800
Oklahoma	†569,800	....	†569,800	†562,800
Texas	2,660,000	62,150	2,722,150	2,722,150
Dist. 1	48,000	475	48,475	48,475
Dist. 2	122,000	9,125	131,125	131,125
Dist. 3	371,000	31,000	402,000	402,000
Dist. 4	199,000	7,500	206,500	206,500
Dist. 5	35,000	500	35,500	35,500
Dist. 6	122,000	7,000	129,000	129,000
East Texas Field	164,000	....	164,000	164,000
Dist. 7-B	148,000	150	148,150	148,150
Dist. 7-C	143,000	3,650	146,650	146,650
Dist. 8	1,000,000	1,500	1,001,500	1,001,500
Dist. 9	201,000	600	201,600	201,600
Dist. 10	107,000	650	107,650	107,650
Utah	15,200	....	15,200	16,850
Wyoming	306,950	....	306,950	308,500
Others	‡200	....	‡200	‡200
Total U. S.	6,694,600	168,900	**6,863,500**	6,881,000
Change from prev. week, down			**17,500**	
Canada	†514,900	....	†514,900	†445,400

Total U. S. production—Jan. 1-Feb. 15 ..... 316,502,840 bbl.

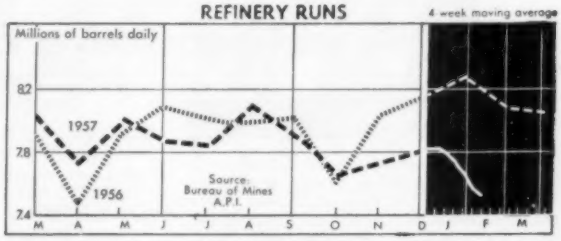
Same period last year (crude plus cond.) ..... *346,597,815 bbl.

*Includes 6,750,525 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

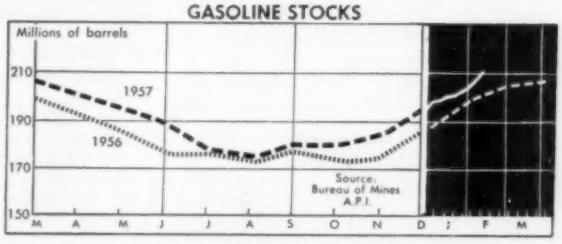
CRUDE-OIL STOCKS



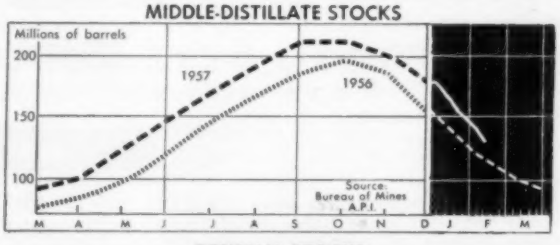
REFINERY RUNS



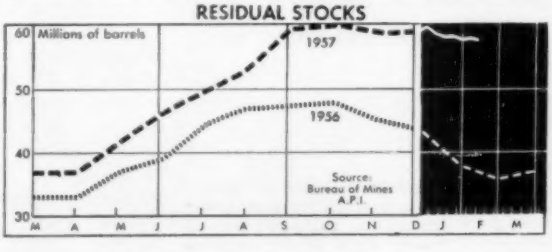
GASOLINE STOCKS



MIDDLE-DISTILLATE STOCKS



RESIDUAL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	2-8-58	2-1-58	2-9-57
Pennsylvania Grade	2,956	2,941	2,360
Other Appalachian	1,573	1,621	2,076
Illinois, Indiana, and Michigan	11,457	11,354	10,260
Nebraska and North Dakota	2,520	2,400	2,112
Kansas	9,587	10,120	9,446
Oklahoma	18,940	19,675	21,179
Arkansas	2,610	2,549	2,926
Louisiana	19,927	20,070	19,229
North	3,065	3,275	2,910
South	16,862	16,975	16,319
Mississippi, Ala., and Fla.	2,816	2,631	2,707
New Mexico	9,197	9,564	7,575
Texas	123,026	121,999	109,399
East Texas	9,469	8,954	8,279
West Texas	53,757	53,059	51,672
Texas Gulf	26,085	25,983	20,714
Other Texas	33,715	34,003	28,734
Wyoming	14,141	14,127	15,722
Other Rocky Mountain	6,716	6,607	6,124
California	37,386	36,970	27,314
Foreign	†16,130	18,593	12,498
Total	278,982	281,221	250,927

*Bureau of Mines. †Includes 5,371,000 bbl. in California.

API REFINERY REPORT—FEBRUARY 14, 1958

(Thousands of barrels daily)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, February 1957—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,147	491.0	39.7	294.0	180.4	43,460	8,826	39,419	11,420	1,176	479.2	39.9	333.5	212.6
Appalachian:														
District 1	101	41.3	4.9	24.6	9.7	5,305	525	2,349	582	100	39.3	6.1	24.2	8.0
District 2	106	52.1	7.1	14.3	8.7	3,053	376	692	454	111	56.9	7.1	21.7	16.6
Ind., Ill., Ky.	1,471	719.9	77.1	321.7	197.7	37,790	4,350	14,429	4,743	1,466	706.1	71.3	340.2	209.8
Minn., Wis., Dak.	109	49.4	6.0	28.6	14.9	7,250	767	5,228	432	103	50.5	6.3	27.0	12.0
Okla., Kans., Mo.	728	378.4	19.6	174.8	36.1	20,454	838	7,755	1,172	689	379.9	15.0	172.5	44.8
Inland Texas	273	198.9	12.0	50.6	23.3	8,817	384	1,468	2,100	270	186.5	7.9	51.7	23.0
Texas Gulf Coast	1,613	849.4	131.7	432.6	191.0	30,745	1,966	11,684	5,518	1,945	879.9	121.5	580.5	242.6
La. Gulf Coast	612	335.0	61.6	130.8	47.6	12,414	1,254	5,770	1,175	685	329.5	62.0	207.2	52.7
N. La. and Ark.	63	35.4	3.4	16.8	7.9	4,945	542	1,897	104	96	37.1	7.3	25.9	7.0
Rocky Mountain:														
New Mexico	29	14.7	1.0	7.0	3.6	406	20	125	86	28	14.3	0.5	5.2	3.5
Other Rocky Mtn.	268	132.3	2.1	61.6	37.7	7,294	275	2,703	924	286	135.1	2.5	68.4	42.3
West Coast	1,000	496.3	7.9	151.3	329.3	28,627	364	14,898	28,424	1,133	494.6	5.2	176.6	394.6
Feb. 14, 1958	7,520	3,794.1	374.1	1,708.7	1,087.9	210,560	20,487	108,417	57,134	8,088	3,788.9	352.6	2,034.6	1,269.5
Feb. 7, 1958	7,325	3,721.0	369.6	1,720.7	1,061.6	208,043	21,580	117,552	57,627	.....	.....	.....	.....	.....
Feb. 15, 1957	7,976	3,761.0	372.9	2,097.9	1,240.3	202,254	22,550	91,385	35,812	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):

Regular (89 octane)	11.25-11.75
Premium (98 octane)	14.00-14.50

Gulf Coast (cargoes for coastwise or export movements):

Regular (90 octane)	10.00-10.50
Regular (92 octane)	10.25-10.50
Premium (97 octane)	11.75-12.00
Premium (98 octane)	12.00-12.50

California (rack) (Los Angeles):

Regular (88 octane)	12.2
Premium (96 octane)	14.5
Premium (98 octane)	15.0

Caribbean area (cargoes):

Regular (87 octane)	9.875
Premium (93 octane)	10.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:

Grade 26-70	4 5

Breckenridge:

Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):

Kerosine 42-44	9.50-9.75
Diesel oil (58 d.i. and above)	9.125-9.50
Distillate No. 1	9.125-9.50
Distillate No. 2	8.50-8.75

Gulf Coast (cargoes):

Kerosine 41-43	8.50-8.75
Distillate No. 2	8.25-8.50

New York Harbor (barges):

Kerosine 41-43	10.35
Distillate No. 2	9.65-9.85
Diesel fuel, 48-52 d.i.	10.25

Caribbean area (cargoes):

Distillate No. 2	8.50

WAX (LB.)

Oklahoma (Group 3):

132-135 A.m.p. (semi-refined) in tank cars	6.50

New York (export):

126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3): Residual fuel (max. 1% S)	$1.25-1.40
Gulf Coast (cargoes): Bunker C fuel	$2.25-2.50
New York Harbor (barges): Bunker C fuel	$2.75
Caribbean (cargoes): Bunker C	$2.35
California (rack): Bunker C fuel, Los Angeles	$2.65-2.80

LUBRICATING OILS

Mid-Continent (Group 3): 150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade: 145-155 vis. at 210, bright stock, 8 color, 25 p.t.	27
200 vis. neutral (180° at 100°), 25 p.t.	25

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour) (§)
14-14.9	$2.67	....	....	....	....
15-15.9	2.71	....	....	....	$1.81
16-16.9	2.74	....	....	....	1.86
17-17.9	2.78	....	....	....	1.91
18-18.9	2.82	....	....	....	1.96
19-19.9	2.85	....	....	....	2.01
20-20.9	2.89	$2.75	....	$2.62	2.06
21-21.9	2.93	2.77	....	2.64	2.11
22-22.9	2.97	2.79	....	2.66	2.16
23-23.9	3.01	2.81	$3.44	2.68	2.21
24-24.9	3.05	2.83	3.46	2.70	2.26
25-25.9	3.09	2.85	3.48	2.72	2.31
26-26.9	3.13	2.87	3.50	2.74	2.36
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low cold test Gulf Coast. ‡Sour. §Some heavy Wyoming sour posted at 8 cents less.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, July 26, 1957.

FLAT PRICES

Louisiana:

Bienville (distillate)	$3.05
Ville Platte	3.45

Texas:

East Texas	3.25
Conroe	3.53
Van	3.08

Pennsylvania Grade:

Bradford	4.65
Middle District	4.47
Southwest Pennsylvania	4.18
West Virginia	4.00
Buckeye Grade	4.00
★ Zanesville Grade	2.72-3.04
Illinois Basin	3.00

Canada:

Leduc-Woodbend	2.74
Redwater (Alta.)	2.63
Smiley (Sask.)	2.40
Pembina	2.61

FOREIGN

Venezuela:

Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.25-2.38
Bachaquero, flat, Las Piedras*	2.03-2.18

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):

Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 35.0°-35.9°, Fao	1.98
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9, Umm Said	2.23

Middle East, E. Mediterranean:

★ Arabian, 36.0°-36.9°, Sidon	2.49
★ Iraq, 36.0°-36.9°, Tripoli, Banias	2.49

Far East (cargoes, f.o.b. Lutong, Sarawak):

Seria Light, 37°	2.75

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., clean (USMC—10%)	$2.57
Gulf-U.S.N.H., dirty (USMC—30%)	2.00
★ P.G.-Italy, dirty (USMC—55%)	3.67
Sidon-U.K. Cont., dirty (Scale—45%) (15s. 7d.)	2.18

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1—Worthington 155 HP, 300 lb. WP.
2—Worthington 100 HP, 500 lb. WP.
2—Worthington 60 HP, 300 lb. WP.
Ingersoll-Rand 300 HP XVG. All with new warranty.
1—Worthington 800 HP stationary, used.
All sizes new packaged units 25 to 750 HP, belt driven, angle frames, and direct driven rotary. Call us for your cylinder requirements.
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Carson Machine & Supply Co.

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MElrose 4-0311

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4" Vacuum to 550 P.S.I. discharge, Total Compressor H. P. 3,295. TOPPING PLANT, complete, 3,000 barrels per day with approximately 170,000 gallons Pressure Storage and 21,350 barrels of other storage. All Equipment may be inspected; inventory furnished upon request. All bids will be subject to Plant Site Lease Agreement and bids must be accompanied by cashier's check for 5% of the total bid and presented personally at First State Bank of San Diego, Texas. For further information, write or call

EARL DELANEY,
P. O. BOX 567,
TELEPHONE 10,
SAN DIEGO, TEXAS

FOR SALE EQUIPMENT

FAILING—Rotary Rig—Capacity 2500 Ft. 2900 Ft. 2⅞ in. x 30 ft. drill pipe, top grade, with new tool joints. Gardner-Denver Pump 5 x 10 skid-mounted. 3—30 ft. drill collars. Hughes core barrel. This rig too large for our needs. Price $20,000. Would consider top grade 1500 ft. at actual value—balance—cash. Hobert Betz—Lane, Kansas—Phone 39.

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U-34 DRAWWORKS Serial #68 with WAK engine Serial #732489 and Torque Converter Serial #90642. Price $15,000.00. 127' Lee C. Moore Mast Serial #T-797 with 5½' x 34' substructure and 16" sub-base, extension braces, etc. Price $11,600.00. All located near Tulsa. Box K-524, The Oil and Gas Journal, Tulsa, Oklahoma.

OVER $150,000

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NEW—1,155—¾" x 16' Type 304, 18 Ga. Stainless Steel Heat Exchanger Tubes.
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1—10" x 12" XVG, Type 54K1E, Type 54K2E, 250# W.P.
1—14" x 12" XVG, Ser. #3T2373, Type 67K1EC, Type 67K2EC, 150# W.P.
2—29" x 15" LVG, Ser. #2T220 and #2T221, Type 104K, 75# W.P.
4—9¼" x 12" XVG, Ser. #3T415, #3T416, #3T417 and #3T418, 250# W.P.
2—14" x 14" XOB, Ser. #51113-7715, 75# W.P.
15—Inlet Valves #54K1, 10" x 12" XVG, #3T908.
12—Discharge Valves #54K2, 10" x 12" XVG, #3T908.

COOPER-BESSEMER COMPRESSOR CYLINDERS

1—8" x 14" Ser. #12489, Class C5A14, Suction 200#, Discharge 500# Ga.
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1—8" Piston, Part #CA-24-EK for Cooper-Bessemer, Class C5A.
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1—**NEW** 7¾" x 20" Ser. #19878, Class CA20, Suction 50#, Discharge 193.6#.
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18" x 32', 15 Tray, 160#
12" x 27', 20 Tray, 450#
24" x 42', 22 Tray, 230# T-304SS
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30" x 20', 8 Tray 50# T-304SS

Valves: Steel & SS ½" through 6"
Furnaces: Petro-Chem, ½, ¾ mil. BTU-HR.

HEAT EXCHANGERS

Steel Tube: 1000, 900, 650, 500, 300, 200 sq. ft.
Adm. Tube: 2250, 2200, 1300, 900, 740, 625, 300 sq. ft.
S.S. Tube: 1228, 947, 570, 536, 386, 315, 250, 157 sq. ft.
4-6% Chr. Tube: 1000, 500 sq. ft.
Fin Tube: 73, 21, 11 sq. ft.

PUMPS

Hot-Oil: 324 gpm @ 4600'; 735 gpm @ 3100'; 400 gpm @ 2000'; 1270 gpm @ 400'.
Water: 10,500 gpm @ 135'

COMPRESSORS

Worth.: LTC-4, Gas Engine, 800 hp.
Penna.: 100 CFM @ 500#; 385 CFM @ 160#

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CABLE TOOL RIG, 28L Bucyrus, less than one year old. Tools from 12½" to 5". Swabs, Packers, 3" Mud pump, Dog house, light plant and Two 1956 Chevrolet Trucks, priced to sell. Ph. RI 2-0453. Address 4216 South Oswego, Tulsa, Oklahoma.

PUMPS: 1—5x10 Worthington powered by 6MZ, 1—5x10 FXOFXO powered by WAKU, 1—7¼x14 Bethlehem on skids, 1—7¼x12 Oil Well, 1—4" Jaeger Centrifugal, 1—Power driven Halliburton measuring device, 1—85 CU gas driven air compressor, 1—Brewster OBL 12 Rotary. List your surplus equipment with us. P. O. Box 814, Phone MI 5-3318, Houston, Texas.

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Box K-569,
The Oil and Gas Journal,
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FOR SALE—Trailer mounted rotary Drilling Rig. 65 ft. jackknife derrick, 5 x 10 Gardner pump. 2850 ft. drill stem. Complete in every detail including International truck and float trailer. $21,000 cash. Contact W. H. Shaw, 1200 Oden St., Longview, Texas, PLaza 8-5096.

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Drums & Receivers: 8'0" x 28'9"; 6'0" x 14'0"; 5'0" x 14'0"; (3) 4'6" x 16'0"; (2) 4'0" 12'0".

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REGENERATION AIR BLOWER, 11,000 CFM, 11 PSIG, Turbine Driven.

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All Steel U-Tube Bundles, Sq. Ft. Area: 947; 705; 220; 165.

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2600	75 PSI	200 HP Motor
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1 Motor & 1 Turbine Driven

(4) 1½" x 2" Two Stage (4) 1½" x 2½" Two Stage
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12 x 5 x 12 (2) 7½ x 4 x 10 (2)
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PROCESS ENGINEER

FOR TULSA, OKLAHOMA LOCATION

Graduate engineer, age to 35 with three years gasoline plant or refinery experience. **ALL INQUIRIES CONFIDENTIAL.**

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PERSONNEL MANAGER

Ethyl Corporation Research Laboratories

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Ferndale 20, Michigan

HELP WANTED

PROCESS ENGINEER—Expanding Independent Refiner located in Southwest has immediate opening for a graduate Chemical Engineer with 6 to 10 years experience in Petroleum Refining. Applicant should have varied background in both practical and technical aspects of petroleum refining. A practical approach to problems is essential for this position. Submit complete resume of experience, education, marital status, salary requirement and recent snapshot. Reply to Box K-538, The Oil and Gas Journal, Tulsa, Oklahoma.

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Graduate engineers with 2 to 3 years of Shell-and-tube heat exchanger rating experience. Excellent opportunity with well established, growing company. Submit resume and salary requirements. All inquiries kept confidential, and interviews will be arranged.

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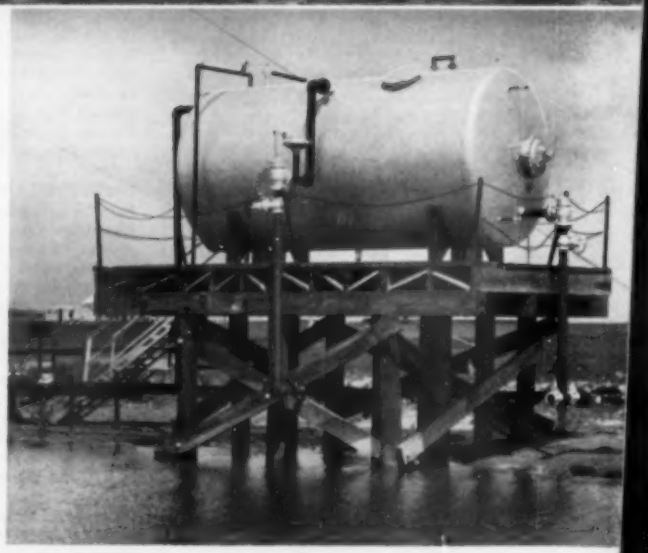

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